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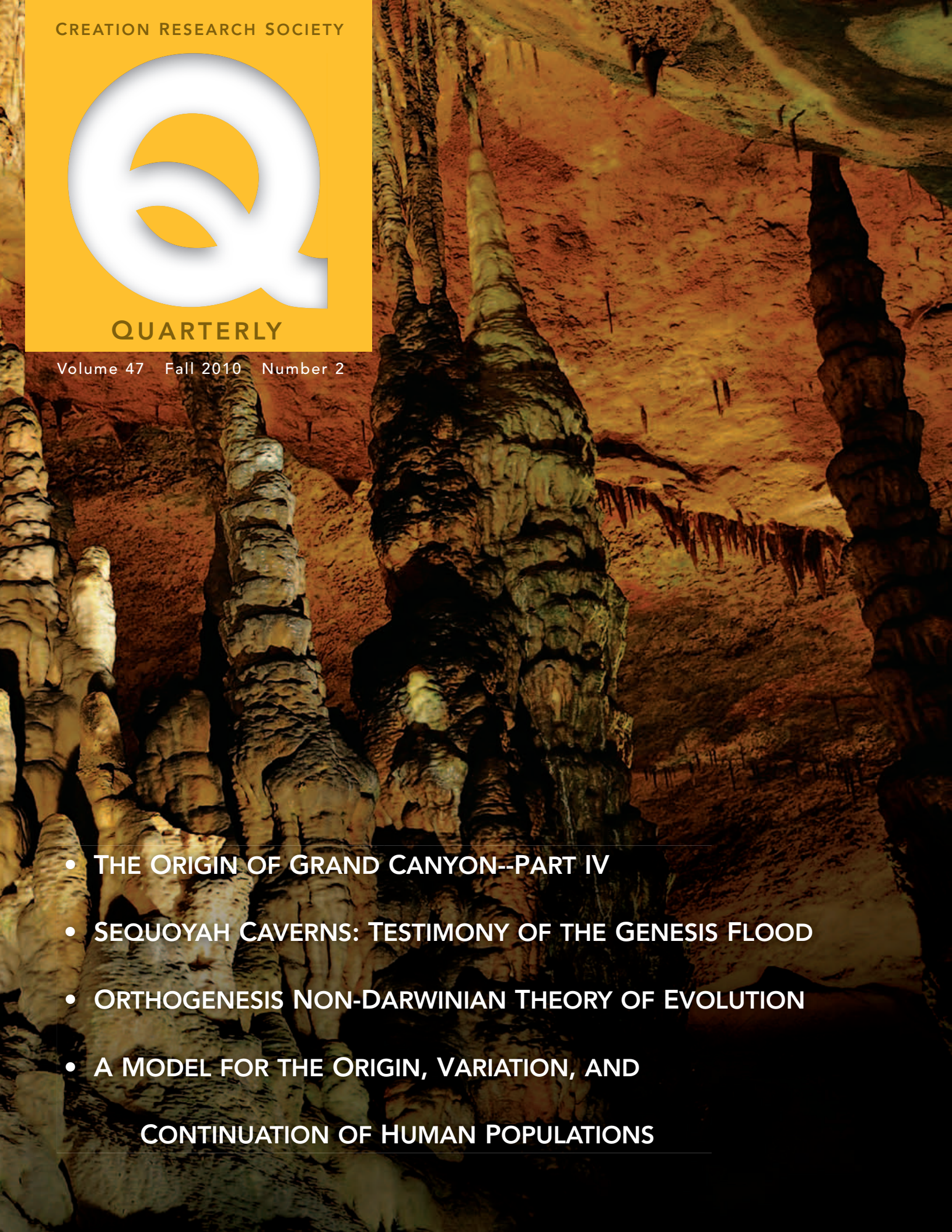

- THE ORIGIN OF GRAND CANYON--PART IV
- SEQUOYAH CAVERNS: TESTIMONY OF THE GENESIS FLOOD
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Haec Credimus

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

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Sequoyah Caverns: A Testimony of the Genesis Flood

A. Jerry Akridge*

Abstract

Sequoyah Caverns is a large cave system in northeastern Alabama. The main cave, open for commercial tours, is the object of this study. Its features, including speleothem formations, erosional wall patterning, fossilized marine creatures, and an unusual sedimentary deposit containing allogenic pebbles and disarticulated fossil mammals, all indicate the rapid and energetic development of this cave within the recent past. The cave system and its surrounding strata are easily explained by the processes of the Genesis Flood and its aftermath.

Introduction

Caves have served many purposes for humans over the millennia: habitation (Dunbar, 1955; Gen. 19:30; Job 30:6); protection from enemies (Judg. 6:2); safety from the elements (Dunbar, 1955); burial places (Gen. 23:19); sources for fertilizer (bat guano), saltpeter for gunpowder (Shaw, 1997), and water; spelunking; mushroom farming; illegal activities; and commercial touring. In 1841, an early pioneer of northern Alabama, James Ellis, settled and farmed the land that includes Sequoyah Caverns. Since that time, direct descendants of Ellis have lived on that land and owned and operated the cave and a campground for visitors.

Uniformitarian scientists use caves to support the concept of deep time. However, evidence presented here will demonstrate that the formation and development of Sequoyah Caverns could have been accomplished in a short period of time in the relatively recent past—as a result of the Genesis Flood.

Geologic Setting of Sequoyah Caverns

Located in DeKalb County of northeastern Alabama (Figure 1), Sequoyah Caverns opens on the eastern side and at the base of Sand Mountain, a synclinal plateau in the Appalachian Plateaus Physiographic Province (Osborne et al., 1989). The entrance to the cave is about 40 ft (12.2 m) above the floor of the anticlinal valley separating Sand and Lookout Mountains. The valley floor has an elevation of ~1000 ft (305 m) above mean sea level (msl) with the top of Sand Mountain above the cave entrance at ~1,560 ft (475.5 m) msl (DeLorme Topo USA, 1999).

This cave system was formed in the Bangor Limestone that uniformitarian scientists place in the Lower Carboniferous (Upper Mississippian) Period of the standard geologic timescale. The Bangor Limestone is one unit within several undifferentiated limestones in this region with a thickness of about 890 ft (271.3 m) (Mittenthal and Yin, 2001). According to uniformitarian assumptions, the Bangor Limestone dates between 360 and 320 million years old (GSA Geologic Time Scale, 1983). This supposed age will be shown to be implausible; a date of no more than a few thousand years better fits the data.

Sequoyah Caverns formed by dissolution of the host rock. Limestone is dissolved by natural acids such as carbonic acid, sulfuric acid (Oard, 1998; Silvestru, 2003), and numerous organic acids that occur in phreatic water (Austin, 1980). Both deep and shallow phreatic theo-

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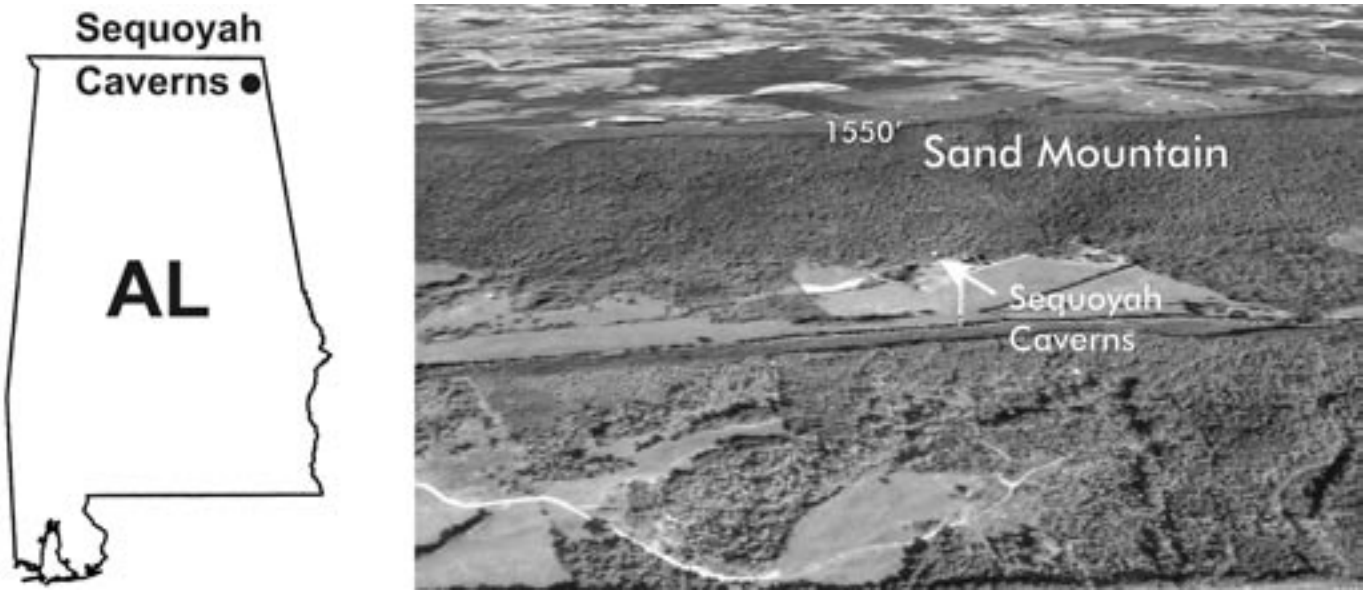

Figure 1. Location of Sequoyah Caverns in northeastern Alabama.

ries of cave formation have the cavity developed while totally filled with water (White, 1960). Then as the zone of saturation drops below the cavity, the cave is filled with air, allowing development of speleothems—mineral deposits, such as stalagmites, stalactites, helictites, flowstone, cave coral, etc.—formed in a cave by carbonate precipitation (Silvestru, 2003). Most uniformitarian models of cave formation claim that weak carbonic acid slowly dissolved limestone cave tunnels over vast periods of time. However, the evidence suggests otherwise.

Evidence in Sequoyah Caverns Favors the Young-Earth Flood Model

Speleothems

Various kinds of speleothems of unusual shapes and colors populate Sequoyah Caverns (Figures 2 and 3). Uniformitarian scientists assume slow growth rates over long periods of time. Hill and Forti (1997, p. 4, emphasis added) offer the general uniformitarian conjecture for the rate of speleothem formation:

Figure 2. Stalactites and stalagmites in the Ballroom in Sequoyah Caverns.

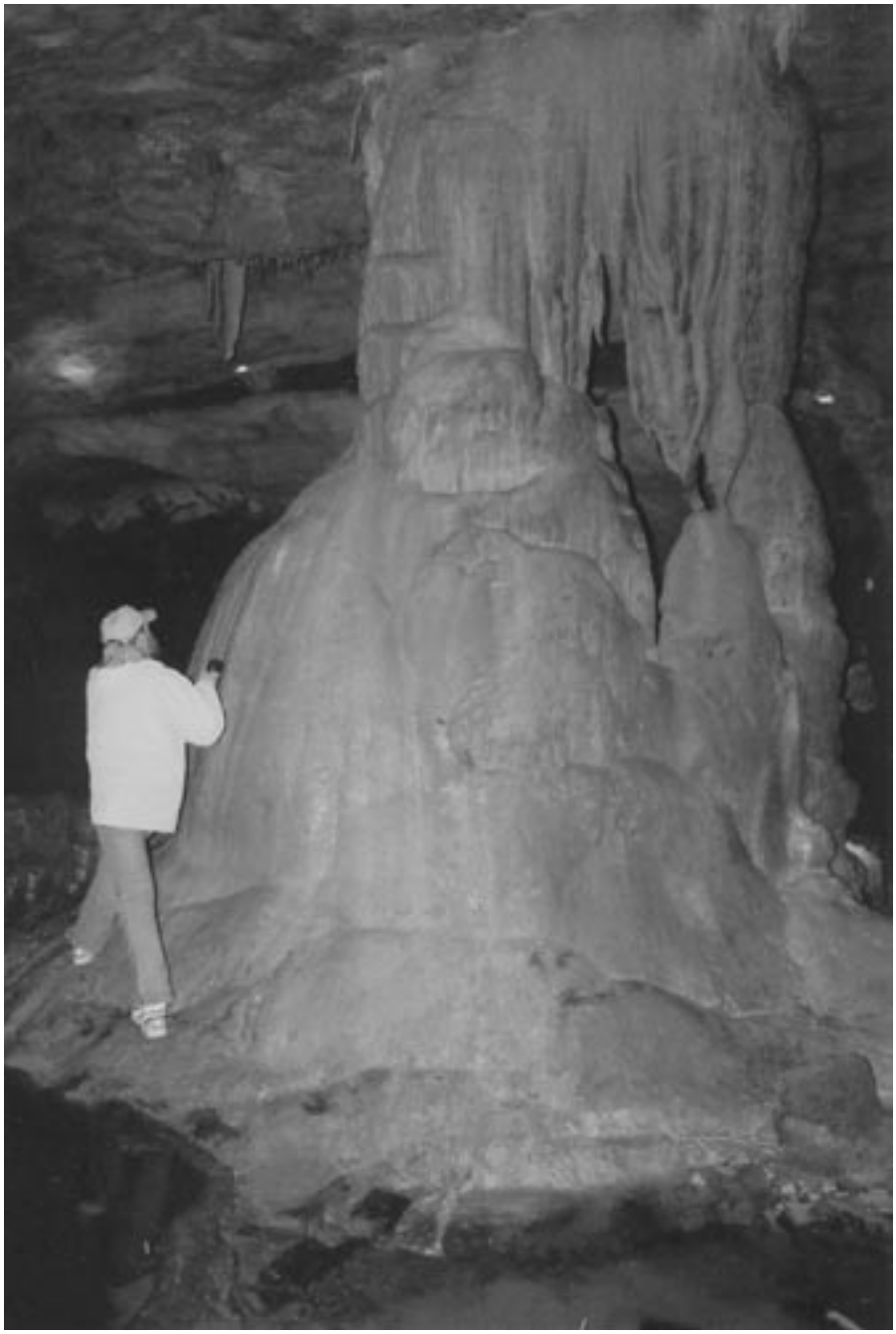

Figure 3. A large double column formed by the union of stalactites and stalagmites.

> Speleothems (cave formations) and cave minerals are fragile, extremely fragile. Delicate soda straws and eccentric helictites, for example, that took *untold thousands of years to create* can be destroyed in an instant by a careless or thoughtless act on our part.

Shaw (1997, p. 27, emphasis added) touches on the conflict between belief in a young earth and the uniformitarian assumption of ancient ages for speleothems:

> Speleothems have always been mysterious and remote—difficult and often dangerous to reach and, although some were enormous, *not perceptively increasing in size from year to year*. They were revered, like all natural things, as God's work. There was indeed a specific interface with the Christian religion because *their extreme slowness of growth* seemed inconsistent with the accepted age of the earth. … *This belief in a young earth affected ideas on speleothem growth. … Directly, it provided a constraint in the form of a maximum possible age*.

Can this conflict be resolved by actually measuring the growth rate of speleothems? To answer that question, we need to consider dripstones—such as stalactites and stalagmites—formed in caves by mineral deposition resulting from the action of dripping water. In some caves, the growth rates of speleothems have been measured and found to vary between 0.004 and 0.125 inches (0.01–0.32 cm) per year (Silvestru, 2003). Using these minimum and maximum figures of speleothem growth rates, a 10-ft (3 m) stalactite could vary in apparent age from 960 to 30,000 years. Williams et al. (1981) reported on a stalactite in Cottonwood Cave that was measured by cavers to have grown 12 inches (30.5 cm) in three months. At that rate, a 10-ft stalactite would develop in 30 months! White (2007) reported that the growth rates of stalagmites mostly fall in the range of ~0.0004 to ~0.004 in/yr (0.001–0.01 cm/yr). At that rate, a 10-ft stalagmite would need between 30,000 to 300,000 years to grow to that size, with those ages far exceeding the time posited by the young-Earth Flood model.

However, in any of these calculations, a fatal flaw in reasoning exists. Because the measurements are taken in a finite slice of time in the present and extrapolated backward in time to obtain the various ages, the resultant data cannot be certain because of unknown factors that might have occurred in the past. A change in the drip rate would significantly influence growth rate. Tectonic

action; variation in local precipitation; changes in pH of the source water; occasional phreatic water infill of the cave (groundwater table changes); amount of water piped into the cave varying either by opening, closing, or constriction of the passages supplying water; ongoing changes in the form of the drip-canal by dissolution of the host limestone supplying carbonate in solution; freezing/thawing of soil (permafrost) changing throughput of water; and various other factors would cause rates of drip and subsequent mineral deposition to vary considerably. All of these many variables preclude an accurate age determination from data obtained in the present.

Rapid Speleothem Growth Noted in Sequoyah Caverns

In 1977, an experiment began to observe the rate of speleothem growth at Sequoyah Caverns. It was facilitated by Clark Byers, who in the 1970s helped operate Sequoyah Caverns and served as a cave guide. He placed a protective panel of clear plastic in an area where stalactites were forming to monitor their physical changes. In less than 10 years, the stalactites had grown about 10 inches (25.4 cm) or about one inch (25.4 mm) per year (Meyers and Doolan, 1987). Today, visitors to the cave can see these speleothems while they are still growing and developing. Stalactites and stalagmites have formed, and some have joined to form columns (Figure 4). At that rate, a 10-ft (3 m) stalactite would form in only 120 years. A four-foot (1.22 m) concrete wall constructed about 40 years ago along part of the tour trail has a flowstone buildup on it that begins on unconsolidated sediment just behind it, continues on the flat, horizontal top of the wall, and has grown down its side to the floor of the cave. The resulting fan pattern of deposited calcite has formed many small rimstone dams, each one complete with its rimstone pool (Figure 5). Speleothem growth rate and calcium carbonate formation are also discussed in Akridge (2002), Matzko (2000), Williams et al. (1976), Williams and Herdklotz (1977), Williams and Herdklotz (1978), and Williams et al. (1981).

What do Measured Rates of Speleothem Material Indicate?

Slow rates of calcite deposition indicate that at the time of measurement, the rate of deposition is slow, and accurate estimates of age are not possible. Also, the same reasoning can apply to measured rapid deposition in the present because the rate of deposition can neither be known from the past nor be projected for the future because of unknown variables. Given these constraints, is there a means of accurately dating speleothems?

Figure 4. Stalactites, stalagmites, and columns that have formed since 1977 and are still growing. Scale in cm and in.

Uniformitarian Methods of Dating Speleothems

Uniformitarian scientists have attempted to date speleothems using radiometry and other methods: carbon-14 (^{14}C), uranium-series radiometric decay, electron spin resonance decay, thermal luminescence, optical luminescence, relative dating, paleomagnetism, and combinations of these dating methods (Ford, 1997). Baskaran and IIiffe (1993) indicated that ^{14}C dating techniques are not appropriate for speleothems formed within the past 1,000 years because of the mixture of carbon sources in them. The upper limit of ^{14}C dating is ~50 thousand years (ka) and does not cover the uniformitarian spectrum of supposed ancient ages needed to support their geologic timescale. Presently, the uranium-series, and in particular, the uranium-thorium (U-Th) method is the "gold standard" for dating speleothems (White, 2007). It supposedly can define the age of a sample as old as ~400 ka and even extend as far back as ~600 ka by counting isotope ratios using a mass spectrometer (Ford, 1997). For example, a calcite layer in a New Mexico cave was dated by the U-Th method as 209 ± 9 ka (Lundberg and McFarlane, 2006). However, various problems associated with radiometric dating techniques render them questionable at best (cf. Woodmorappe, 1999).

Speleothem Production and Ages of Caves as Seen in the Young-Earth Flood Model

How does a creation scientist counter ancient ages reported by uniformitar-

Figure 5. Flowstone is being formed on loose sediment above and to the right of this 40-year-old concrete wall, covering the top of the wall and flowing down its side onto the cave floor. Many small rimstone dams and their pools occupy much of the area of the deposition above the wall and also continue forming on the upper part of the wall. Scale in cm and in.

ians? Much can be inferred from what is known about speleothem growth rates viewed through the lens of the young-Earth Flood model. Once a cave developed in the phreatic zone and lowering of the water table placed the cavity in the vadose zone, speleothems could form within the air-filled void. During, and even for a time after, the Genesis Flood, great quantities of water were available to develop caves. Because of the magnitude of the pre-Flood florae that covered the landmasses, carbon dioxide (CO_2) concentrations in the atmosphere would probably have been much higher. Water from heavy rainfall in the later stages of the Flood and afterwards would pick up the CO_2, forming carbonic acid that could react with underground limestone strata and help form caves. This would lead to much higher concentrations of dissolved calcite in the water that would substantially increase the rate of speleothem growth in the air-filled cave tunnels. This process continues, but with less precipitation and weaker carbonic acid than probably existed after the Flood, due to a lower percentage of atmospheric CO_2 today. That would result in a much lower rate of cave and speleothem formation than would be expected during and immediately after the Flood.

Uniformitarians usually date caves in millions of years (Ma). For example, White (2007, p. 86) indicated that cosmogenic isotope dating (used to indirectly date caves) is a recent method of dating certain cave sediments that covers a "timescale back to 5.0 Ma," which he writes is the "timescale for most active karst systems." Ford (1997, p. 282) stated that "a great many of the world's caves are probably between one and ten million years in age." Osborne (2005) indicated that "there are few open caves that have been reliably dated to ages greater than 65 Ma. This does not mean that such caves are extremely rare." These different opinions indicate that there are perplexing and unanswered questions about cave formation in the uniformitarian camp.

If the ages of caves are as old as geologists allege, then many active cave tunnels would be predicted to be filled or mostly filled with calcite and other mineral deposits and would not be large, open passages like Sequoyah Caverns. Active caves today exhibit speleothems that are still growing and developing,

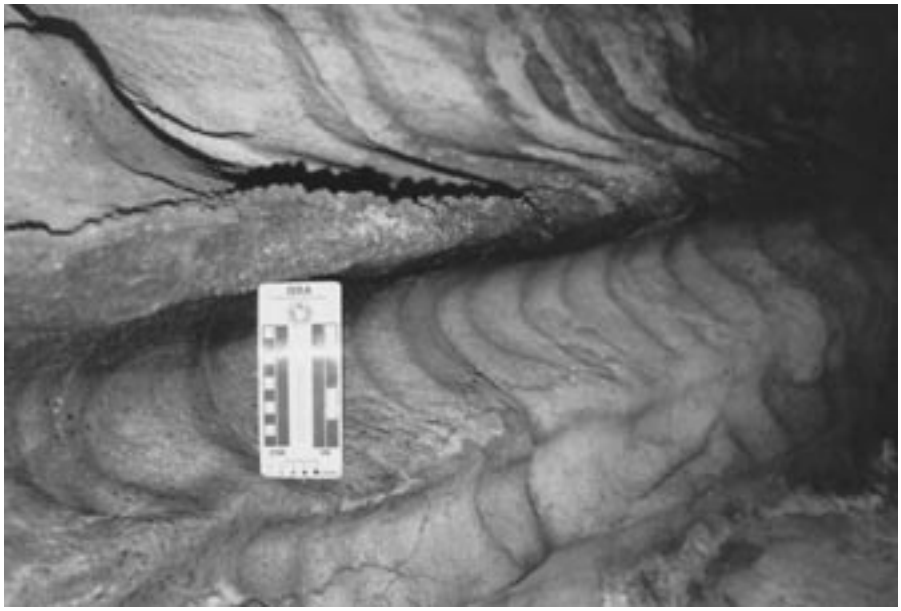

Figure 6. Erosional wall patterning is formed by high-velocity water flow containing abrasive particles and is seen in this short conduit that originally fed a great amount of water into the cave. In contrast to the dynamic water flow that formed these features, now only enough water is ever present to barely moisten the floor of the conduit. Scale in cm and in.

Figure 7. Many well-preserved marine fossils such as *Archimedes* are found in the limestone exposed in Sequoyah Caverns. A crinoid stem is visible near one end of the *Archimedes*. Scale in cm and in.

contradicting the ages conjectured by secular scientists. In Sequoyah Caverns, rapidly growing speleothems supply evidence favoring a recent age for both the cave system and its speleothems.

Erosional Wall Patterning in the Bedrock

Erosional wall patterning can be seen in certain areas of Sequoyah Caverns (Figure 6). These erosional features in the bedrock of the cave are the result of significant water flow during cave development. Sizes and shapes of these erosional features indicate velocity and direction of the water current that formed them (Jenolan Caves, 2010; Maslyn, 2001).

These features likely were formed when the cave was completely filled with water and shortly after, as the water table dropped. These features indicate a powerful flow of water, aided by abrasive materials, carved the bedrock during the cave's genesis. The fact that little or no flow takes place today in Sequoyah Caverns is evidence of unique paleoenvironmental conditions. Although uniformitarian models of cave formation employ stasis over deep time interspersed with random bursts of energetic events, a more reasonable explanation is supplied by high-energy geologic processes that occurred during the Genesis Flood and formed caves in a rapid and catastrophic manner

Marine Fossils Found in Sequoyah Caverns

Contained within the limestone bedrock of Sequoyah Caverns are voluminous marine fossils that remain as a testimony to the power of catastrophic water action during the Flood. Innumerable broken lengths of crinoid stems—remnants of stalked echinoderms that were prolific in the pre-Flood oceans—densely populate the limestone bedrock of the cave passage. Perfect five-sectioned heads of the blastoid *Pentremites* are also easily found. Specimens of once delicate bryozoans, such as spiraled *Archimedes* (Figure 7) and lacy, fanlike *Fenestella*, are represented as beautiful life-forms frozen in time.

A Creationist Interpretation of the Formation of Sequoyah Caverns

Secular geology does not have a credible interpretation for the formation of caves that are hundreds or thousands of feet underground and formed by dissolution of limestone by acidic water. Water loses its acidity in the first 100 ft (30.5 m) after penetrating the surface of a limestone (Silvestru, 2003). The question then arises: how can acidic water dissolve rock to form deep caves, such as Sequoyah Caverns? Acidic water can reach great depths only via preexisting conduits (Silvestru, 2003). Physical evidence at Sequoyah Caverns points to its origin by processes associated with the Flood.

During the Flood, thick deposits of sediment were laid down in this region. With its southern terminus in Alabama,

the Appalachian Valley and Ridge Province contains thousands of cubic miles of sedimentary deposits—visible reminders of the Flood's scale and power. Sandstone, limestone, shale, and conglomerate are found throughout the Valley and Ridge Province (New Georgia Encyclopedia, 2006; Williams and Akridge, 2005). The rock record left by the Flood in the vicinity of Sequoyah Caverns is more than one mile thick (Osborne et al., 1989).

Initially, these strata deposited by the energetic Floodwater could have appeared in cross section as superposed layers of varying composition (Figure 8a). Still submerged, but before fully lithified, powerful compressional forces began acting on these newly deposited strata. Because these forces were exerted in a horizontal plane, the sediments deformed into sinusoidal shapes extending over hundreds of miles, and causing compressional and tensional stresses (Figure 8b) (Williams and Akridge, 2005). The resulting anticlines and synclines characterize the Valley and Ridge Province.

Afterwards, as the water of the Flood began to drain from the region, strong currents would have flowed parallel to the longitudinal axes of the anticlines. Psalm 104:8 gives an excellent description of what may have been happening across this region, as it describes rising mountains and subsiding ocean basins. This geologic upheaval would have provided a mechanism for accelerated drainage. Words used in Psalm 104:7 indicate drainage was rapid: *they* (the waters) *fled* and *they hasted away* (KJV), *the waters fled* and *they took to flight* (NIV), and *they fled* and *they hurried away* (NASB). Erosive currents in the retreating waters, while flowing over the anticlines and synclines, likely caused preferential erosion of the anticlines. Today, the anticlines are lower in elevation than the synclines.

Tensional stresses in the lithifying anticlines caused by compression (Wil-

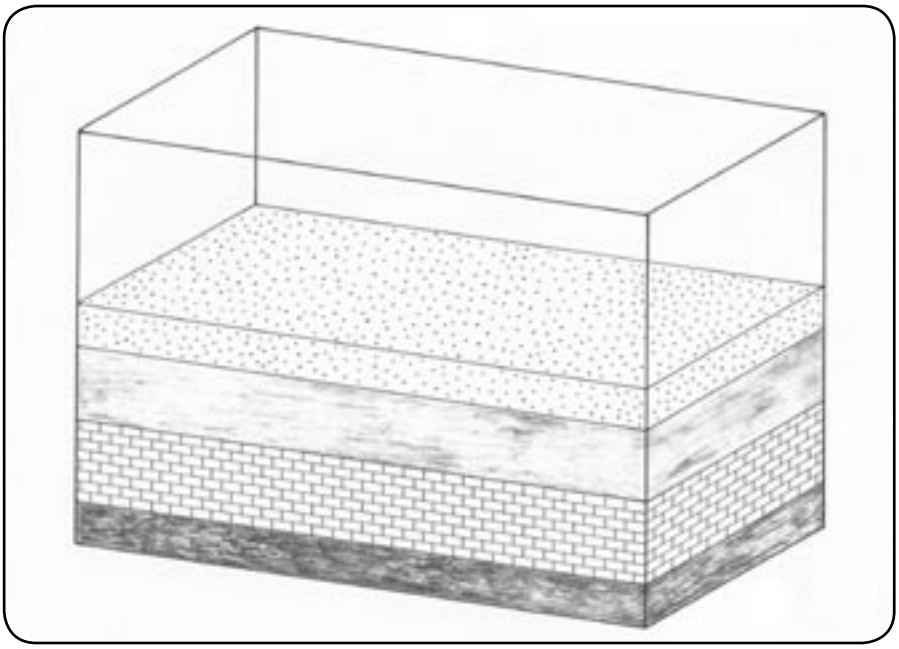

Figure 8a. The Appalachian Valley and Ridge Province was formed from Flood-laid sediments that were originally deposited over thousands of square miles in numerous horizontal layers (strata). These drawings (8a-8e) are not to scale and do not show all the many strata in this area, but the main stratum of interest, the Bangor Limestone containing Sequoyah Caverns, is indicated. Drawn by Elizabeth Akridge.

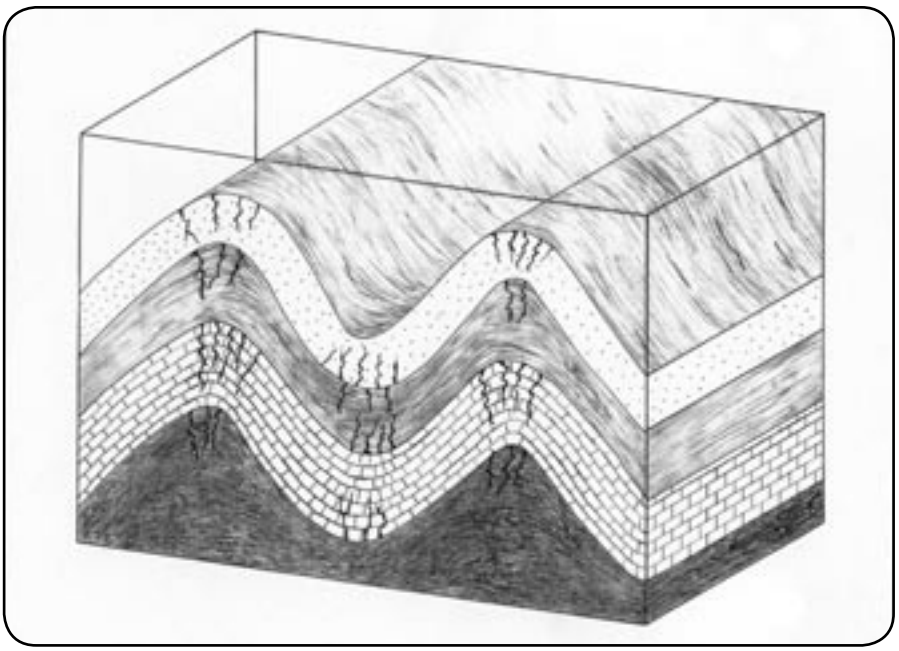

Figure 8b. After deposition in the Flood and before strata fully lithified, powerful compressional and tensional forces were exerted on the Flood-deposited strata, resulting in their being folded into sinusoidal shapes. Cracks developed along the tops of the folded layers by tensional forces during the deformation process. Drawn by Elizabeth Akridge.

liams and Akridge, 2005) caused fractures to propagate into underlying strata. Piping through these fractures would have enhanced erosional rates due to the high-pressure head available at that time. As the crests of the anticlines were eroded by receding Floodwater, these fractures would have enlarged, accelerating the rate of erosion along the anticlinal crests (Figure 8c). Once currents penetrated the interior of the anticlines, the rate of erosion could have increased due to less-lithified sediment and structural zones of weakness. Sediments in the interiors of the anticlines could have remained less lithified due to high fluid pressures slowing expulsion of entrained water. As erosion continued, increasing volumes of sediments would have been removed from the interiors of the anticlines. Eventually, the anticlines were eroded more deeply than their neighboring synclines.

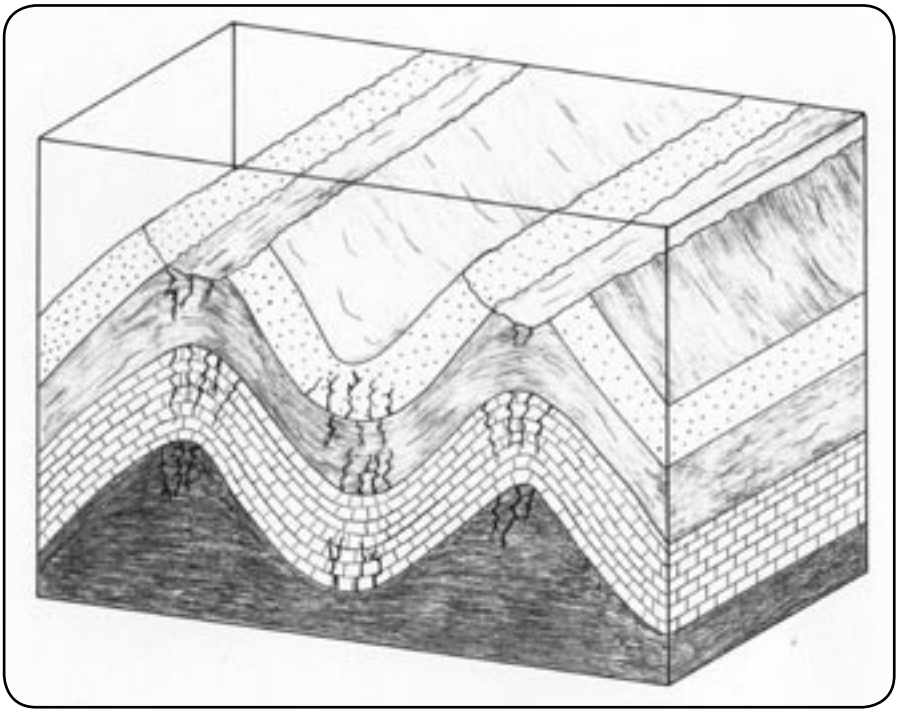

Figure 8c. During the Flood, conditions prevailed that enhanced greater erosional rates of the anticlines, ultimately reducing their elevations far below the synclines. Floodwater current is in direction toward viewer, paralleling longitudinal axes of anticlines and synclines. Drawn by Elizabeth Akridge.

Sand Mountain is one such elevated syncline. Deep fractures in the adjacent anticlines ultimately penetrated the partially lithified Bangor Limestone. Before those anticlines were eroded down to the elevation of the Sand Mountain syncline, water under high pressure would have been piped through these fractures, enlarging them. The pressure head was supplied by the significant elevation difference between the top surfaces of the anticlines and the limestone stratum underlying the Sand Mountain syncline. These fractures would become the conduits for the rapid flow of acidic floodwater into the Bangor Limestone. Several of these conduits can be seen today in Sequoyah Caverns as large ceiling fractures and side tunnels, such as "Whale's Tongue." One conduit called "Sow's Belly" exhibits evidence of significant flow in the erosional patterning on its walls (Figure 6). Today, the conduit is dry; only rarely is any trace of moisture ever seen.

Cave formation was influenced by several factors, including: (1) elevated head pressure of the water flowing through the Bangor Limestone, (2) hydraulic milling when cracks allowed pressure differentials and resulting flow through them, (3) elevated underground temperatures resulting in probable hydrothermal water availability, (4) elevated atmospheric CO_2 increasing carbonic acid concentration, (5) acidic fluids moving upwards through the rocks due to compaction, and (6) the possible presence of sulfuric acid, which would have dramatically lowered the pH.

Sulfuric acid is produced by the oxidation of hydrogen sulfide (H_2S) gas in hydrothermal water (Oard, 1998; Silvestru, 2003). H_2S occurs in groundwater from the breakdown of buried organic matter such as decaying plant material. H_2S is also found in water that comes from shale, sandstone, and water that is near coal or peat deposits (Oram, 2008). Strata in this area contain shale, sandstone, and coal. As plants buried by the Flood began to decay or to form coal, H_2S could have formed, providing a source for sulfuric acid in the hydrothermal waters. This would have increased the rate of dissolution of limestone, quickly forming caves (Jagnow et al., 2000; Oard, 1998; Silvestru, 2003). This seems likely, since today's Sulphur Springs, a nearby source of water emanating from a limestone aquifer at the base of Sand Mountain, emits H_2S (Dekalb County Communities, 2008).

With conduits supplying the synclinal limestone with hot, high-pressure, acidic water, vast volumes of the limestone could have rapidly dissolved even lithified zones, forming large-diameter, deep, water-filled passages. During that time, the neighboring anticlines continued to erode. Before they reached the elevation of what is now Sequoyah Caverns, that tunnel could easily have extended horizontally in the limestone

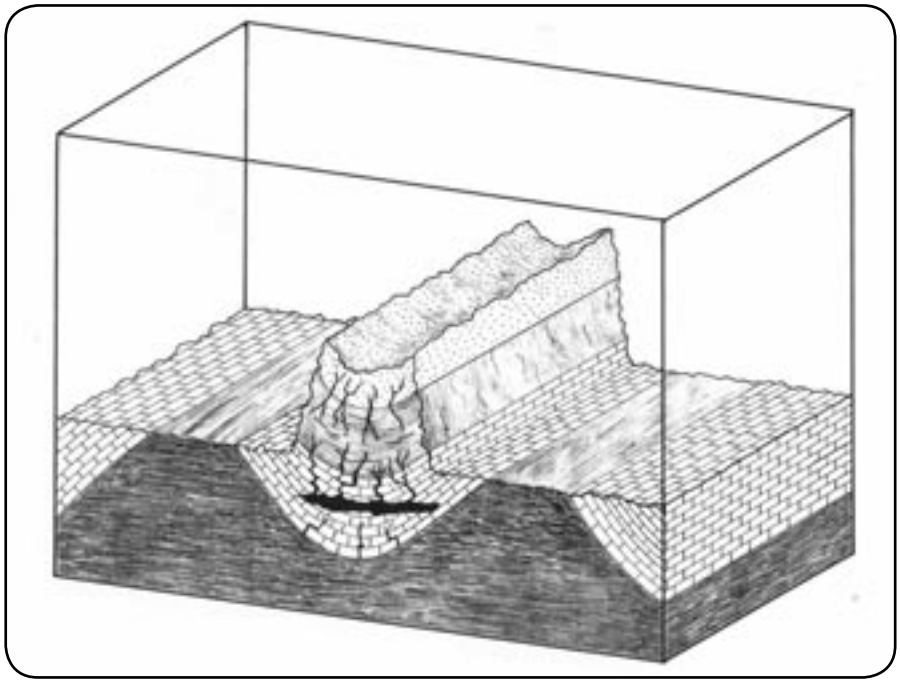

Figure 8d. Anticlines eroded below the elevations of the synclines, forming synclinal mountains like Sand Mountain illustrated here. During that process, a cavity developed in the limestone, ultimately becoming Sequoyah Caverns. Floodwater current is in direction toward viewer, paralleling longitudinal axes of anticlines and synclines. Drawn by Elizabeth Akridge.

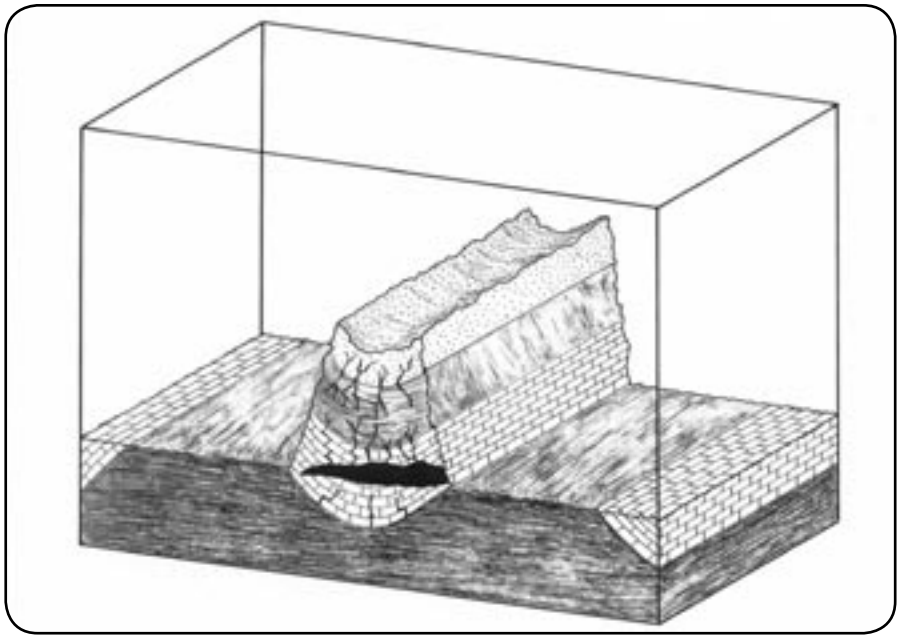

Figure 8e. The cavity that became Sequoyah Caverns was breached by the downward erosion of its adjacent anticline, resulting in the expulsion of most of the sediment and detritus that filled the cavity. Floodwater current is in direction toward viewer paralleling longitudinal axes of anticlines and synclines. Drawn by Elizabeth Akridge.

beyond what is now Sand Mountain (Figure 8d). Once the tunnel was breached by erosional downcutting of the anticline (Figure 8e), huge volumes of pressurized water from the tunnel would have been expelled from what is now Sequoyah Caverns into the Floodwater current as it swept by the newly exposed tunnel opening. Water would continue to flow through the tunnel, but the temperature, pressure, and water chemistry would likely be quite different, though it would still retain significant mechanical erosive power. Dewatering of strata in the interior of the rising Sand Mountain, and subsequent post-Flood precipitation would continue to enlarge the cave system, though at a slower rate.

Evidence Favoring the Rapid, Catastrophic Formation of Sequoyah Caverns

A variety of features of Sequoyah Caverns indicate a rapid and catastrophic origin for the cave system. Sequoyah Caverns contains a peculiar, unlithified sediment composed of angular, unsorted, fragmented, conglomeritic, and water-transported allogenic siliceous pebbles typically found as patches of sediment on the ceiling and walls (Figure 9). An alert cave guide found fossil mammalian remains within this sediment in a karst alcove located in an eroded fracture intersecting a sidewall of the cave. This small alcove is cylindrically shaped, about 2.5 ft (0.76 m) high and 1.5 ft (0.46 m) in diameter, with a small opening on the side of the fracture in the limestone bedrock (Figure 10).

The disarticulated remains are of an unidentified mammal, similar in size and morphology to a 15–20 pound canine. What made this find so intriguing is that the fossils are embedded in a thin (~3-inch) layer of the sediment found pasted on the limestone ceiling of the alcove. Non-petrified bones and teeth were found (Figures 11 and 12) by excavating carefully upward into the sedi-

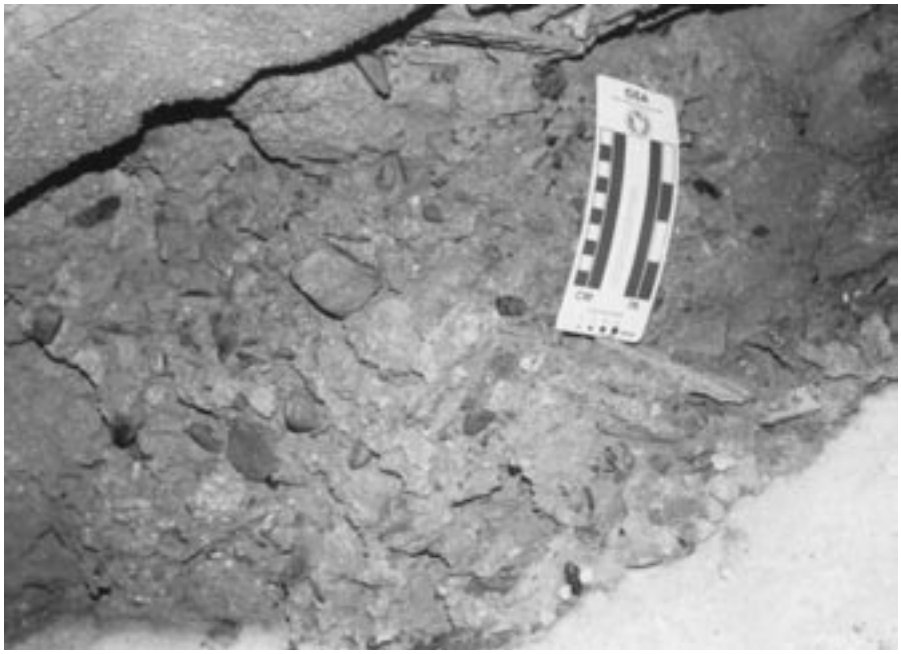

Figure 9. One example of the patches of thin sediment found on the ceiling and walls of the cave. Note the inclusion of siliceous, angular, and unsorted pebbles in the sediment. These pebbles and sediment came from sources outside the cave. Scale in cm and in.

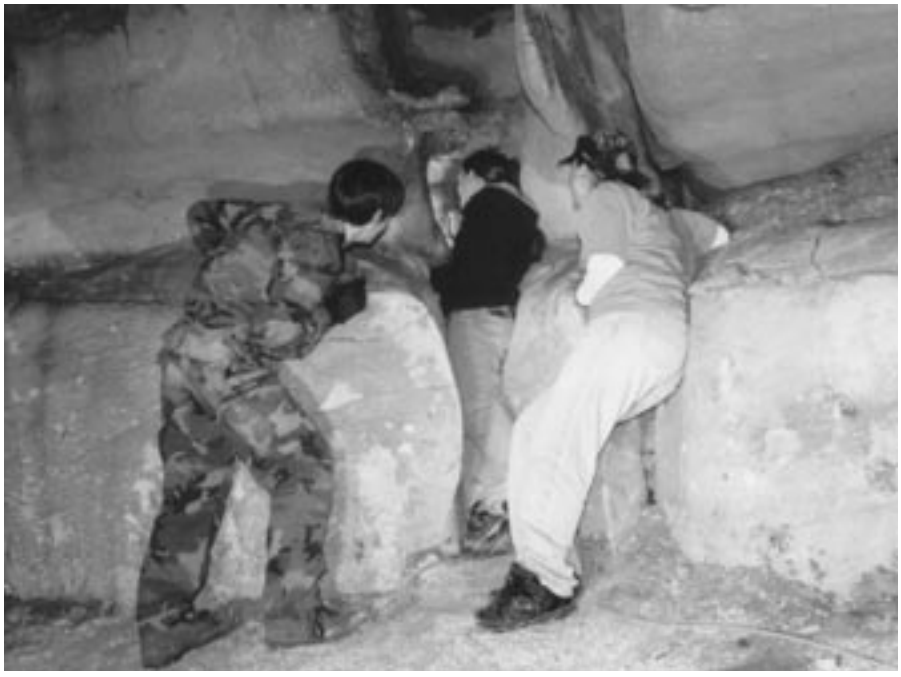

Figure 10. The center excavator has squeezed herself into the narrow joint leading to the small, round opening she looks into on the left side of the wall of the joint. A light placed in the hidden karst alcove defines its entrance point. That opening leads into the karst alcove where mammalian fossils were discovered in the thin sediment remaining on its ceiling. Specimens of disarticulated bones and teeth were removed for analysis by a careful, "upside-down" excavation.

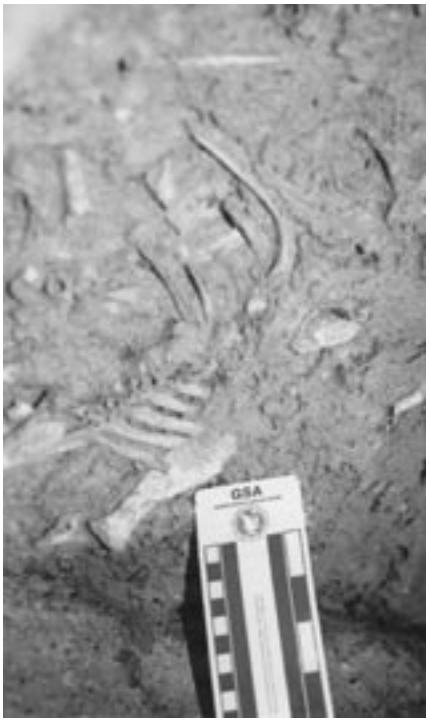

Figure 11. Bones as they appeared in the thin sediment on the ceiling of the karst alcove before being excavated. Scale in cm and in.

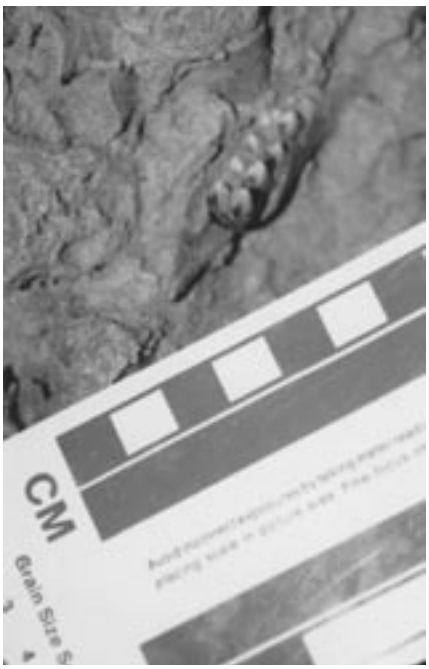

Figure 12. A partial mandible displaying four bicuspid teeth protrudes from the sediment on the ceiling of the cave in close proximity to the karst alcove. Scale in cm and in.

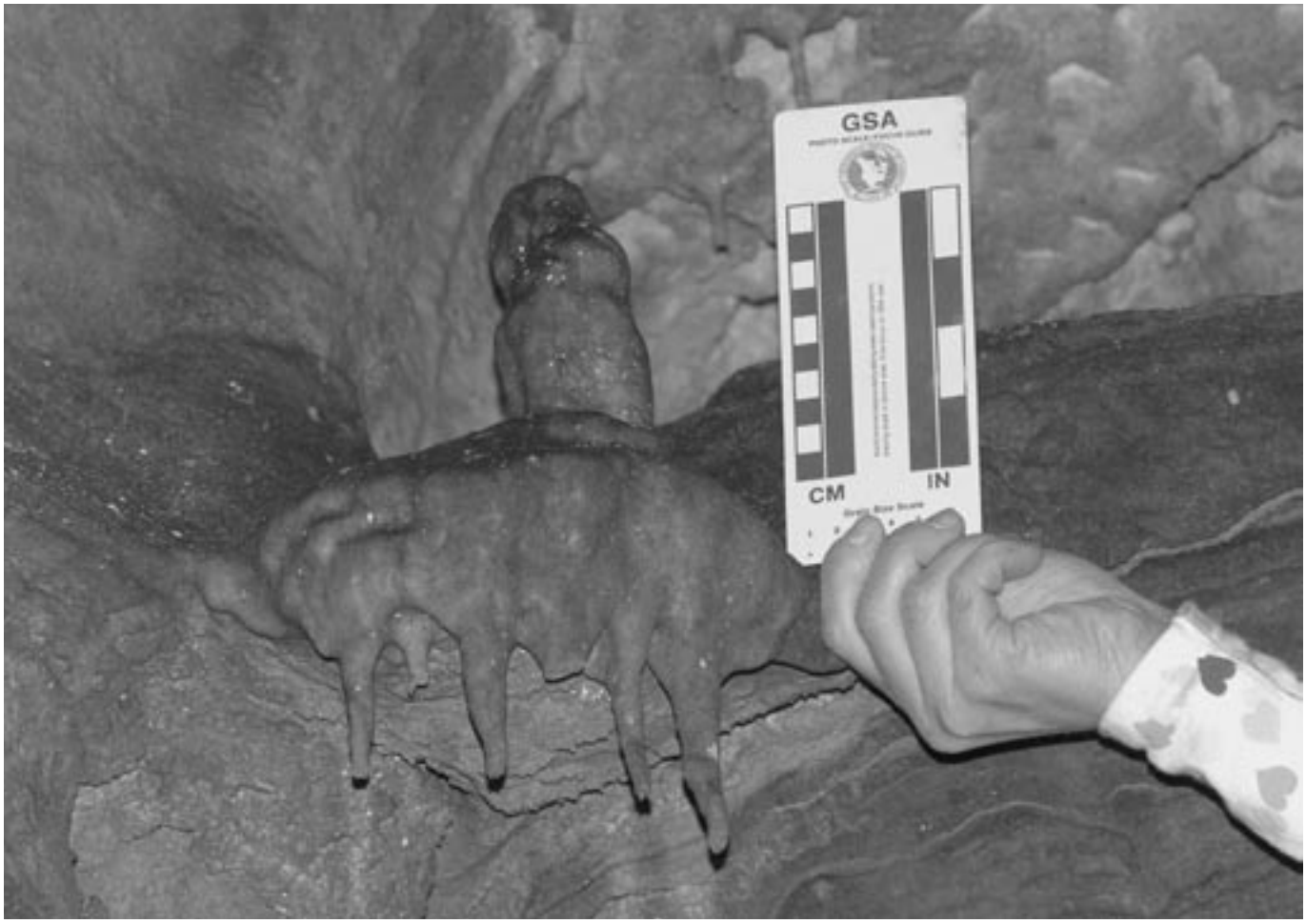

Figure 13. Near the excavation site and at the 12-ft ceiling of the cave, a narrow limestone shelf contains sediment that flowed over the edge of the shelf when the cave was being emptied of its infilling sediment through activity of the Flood. A stalagmite and accompanying small stalactites formed on the sediment after it hardened. These speleothems are still growing. Scale in cm and in.

ment. Some of the fossils were removed to identify the animals and gather any useful information. The bones were also dated using ^{14}C tests (see Appendix).

How were the sediment and fossils emplaced? Why is sediment found on the walls and ceiling of the cave, rather than the floor? How were allogenic pebbles deposited in sediment high on the ceiling and walls? And how were mammalian remains deposited on the ceiling of the solid limestone alcove? The best answer is that these sediments once filled the tunnel of the cave, and that the remaining patches on walls and ceilings are remnants. Because the patches are found scattered throughout the cave, the original extent of the sediment must have been great. It would have taken an immense volume of sediment to fill the cave complex. How was it deposited? How was it eroded? Where did it all go?

A Creationist Interpretation of Sequoyah Caverns Provides Answers

As described above, once the cavity that was to become Sequoyah Caverns formed deep within Sand Mountain during Floodwater runoff, the conduits that formed during erosion of the adjacent anticlines would not only have supplied large volumes of water to the Bangor Limestone, but also would have transported florae, faunae, pebbles, and sediment into the newly formed cavity. Unsorted pebbles, derived from as much as hundreds of miles upstream, would have been present in the slurry flowing through conduits. Thus, the cave passages were filled by various detritus, including the disarticulated animals killed in the Flood. Bloated, buoyant body parts would have tended to float on top of the slurry filling the cave passages, and thus would have been entombed at the top of the fill. "Quiet" zones in the tunnel would have trapped organic material circulating on top of the slurry. For example, the karst alcove containing

mammalian fossils would have been an ideal "quiet" location for such floating material to be fixed in the matrix of sediment as it filled the cavity. Ultimately, sediment completely filled the tunnel and its associated voids.

How was that cavern fill removed from the developing cave and transported away? It is possible that when retreating Floodwater finally breached the cave at what is now the mouth of Sequoyah Caverns, there was greater hydraulic pressure inside of the caverns (Figure 8e). That pressure expelled water and sediment from the cave, emptying most of its sediment and detritus. Also, products, such as gypsum ($CaSO_4.2H_2O$), formed by the reaction of sulfuric acid (H_2SO_4) with limestone ($CaCO_3$), would have been flushed from the cave. That flow would have persisted due to dewatering of the Sand Mountain syncline. Later flow through the cave system caused by post-Flood precipitation would have further removed sediment. Thus the cave would have been purged of most of the sediment, leaving behind the irregular patches seen today on the ceiling and walls. Ultimately, the water table dropped below the floor of the cave, allowing speleothems to develop in the air-filled passages.

A small ledge near the ceiling of the cave and close to the fossil excavation site contains an interesting remnant of this sediment on its horizontal surface. As the majority of the sediment surrounding the ledge was purged, part of the plastic sediment on the small ledge "flowed" over its edge and solidified in that position. After the cave filled with air, a stalagmite formed on the hardened sediment that now hangs there (Figure 13), providing evidence that the mud entered and exited the cavity before speleothems began to form. Neither sediment nor water could have filled the cave tunnel afterwards because the elevation of the cave entrance on the eastern side of the Sand Mountain syncline is higher than the adjacent anticlinal valley floor and no evidence exists indicating that the entrance was blocked after it was opened.

Summary

The young-Earth Flood model provides a reasonable explanation for the origin of Sequoyah Caverns. It is supported by physical evidence in and around Sequoyah Caverns. Important features include: (1) remnant patches of sediment on the walls and ceiling of the cave, (2) allogenic pebbles in the sediment, (3) mammalian fossils contained in the sediment on the "ceiling" of a karst alcove, (4) the absence of most of the sediment that once filled the cave, (5) erosional, patterned markings on the walls of the cave, (6) marine fossils in the limestone bedrock, (7) speleothems, and (8) the peculiar characteristics of the regional anticlinal/synclinal topography. These are well explained by the Flood model but not by uniformitarian theories.

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Elizabeth Akridge, my faithful wife and companion through life, provided encouragement during the various stages of this research, including drawing the needed illustrations.

Although many have graciously given of themselves to see this effort completed, any omission or mistake that may remain is my own oversight.

To the Creator be all praise, honor, and glory!

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Appendix

The discovery of mammalian fossils in an out-of-the-way karst alcove by alert cave guide Carrie Payton provided scientific evidence leading to understanding events that support a creationist interpretation of the formation of this cave during the Noahic Flood. After the fossils were discovered, the owners were interested to find what could be learned by studying the fossil remains, so a partial excavation of the fossils was undertaken over three days in February 2007.

The first bones to be removed were those mostly exposed to air and those protruding from the sediment and downward into the air from the remnant three-inch-thick sediment that was deposited on the solid limestone "ceiling" of the small karst alcove. We found that bones exposed to air were fairly substantial, but bones contained completely in the sediment had the consistency of a jelly-like substance and could not be removed from the sediment without disintegration. The tooth enamel of the disarticulated and non-petrified fossils remained, while the internal part of the teeth had long ago dissolved away.

Enough of the substantial bone fragments were available for analysis by an accelerator mass spectrometer to obtain a Carbon-14 (^{14}C) age-date. The ^{14}C age-date was reported to be 2910 ± 50 ^{14}C years BP (^{13}C corrected), based on the Libby half-life of 5570 years and BP referenced to AD 1950 (Geochron

Laboratories, 2008). Although the ^{14}C age-date does not correlate with the date of the Noahic Flood of ~4,300-4,500 years ago, an age discrepancy was expected because of problems associated with radiometric dating techniques, in particular with the possibility of contamination of specimens by organic products influencing ^{14}C dating. The fossils could have been subjected to contamination and penetration by soluble organic remains such as fungi, fecal residue from bats, effluvia from the breath of thousands of persons who have toured the cave, dust from various organic sources, and airborne pollen from outside florae that filter into the cave. Such contamination would expectedly lower the ^{14}C age. Also, the pre-Flood atmosphere is thought to have had less ^{14}C than now because of better shielding from cosmic ray bombardment and that would be a possible factor to consider in trying to ^{14}C age-date Flood fossils. Regardless of what the ^{14}C testing demonstrates, their deposition in the Flood-deposited sediment as described in this paper would render them Flood-aged animals that met their demise in catastrophic, hydraulic, and high-energy events during the Genesis Flood. Additional studies of the fossils are in progress.

DVD Review

Life's Story: The One That Hasn't Been Told (DVD)

Exploration Films, Monument, CO

2004. 56 minutes, $23.00.

Life's Story is a DVD that highlights the design seen in the animal kingdom and demonstrates how such design could not have evolved by chance processes. The film contains two parts. The first is focused on underwater ocean life and the second on African wildlife. The footage is excellent, and the creatures discussed are fascinating.

The first section looks at how complex ecosystems exist underwater. Such systems contain many different types of plant and animal species that are interdependent. For example, certain coral reefs that many plants and animals depend on for shelter and food are themselves dependent on parrotfish to eat the algae growing on them. These types of relationships, known as *symbiosis*, demonstrate that evolution could not have produced either of the creatures, for if one existed without the other at some point, how could they survive? The production also highlights dolphins and shows how their design features are best understood as the creation of God, rather than randomly evolved matter.

The second section of the documentary discusses different African animals, including wildebeests, lions, giraffes, and ostriches. Each of these animals shows evidence that they were designed by God and did not evolve.

I came away from this film wondering how anyone could believe that random processes have produced such amazing creatures. The film ends by emphasizing that the Creator who made the whole world also sent His Son to die that we might have eternal life. The presentation is lengthy, at almost 56 minutes, but the story is worth hearing. This DVD is sure to become a standard in the creation library.

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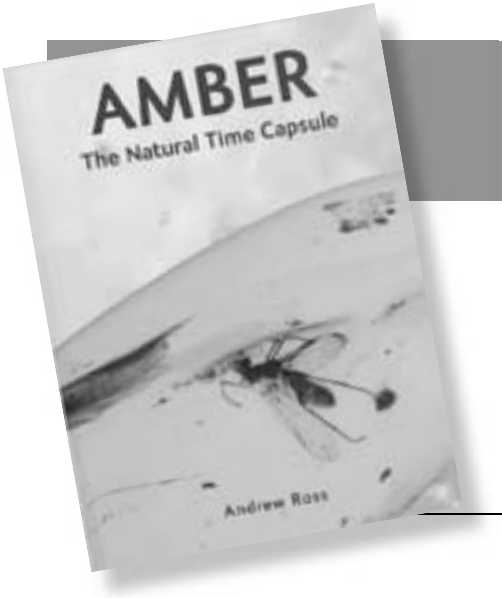

Book Review

Amber—The Natural Time Capsule

by Andrew Ross

Firefly Books, Buffalo, NY, 112 pages, $30.00.

Author Ross is principal curator of invertebrate paleontology and paleobotany at the National Museums Scotland. This book arises from his earlier work of organizing the amber collection at the Natural History Museum of London. The book's glossary defines amber as "fossilized tree resin that is usually yellow or orange in color and is commonly used in jewelry" (p. 108). Amber originates from tree resin, especially conifers. The fossilization process, or amberization, is a polymerization of the sticky material, together with a loss of volatile oils. The resulting solid amber is an amorphous, polymeric glass.

The book assumes that amber is millions of years old, although "Amber can only be dated based on fossils in the associated sediments" (p. 20). I was disappointed that the author did not mention the fundamental dating problems associated with living fossils. This is especially true for insects, a common component of amber. All amber is dated at 150 million years or younger (p. 20). Age uncertainty is admitted without explanation: "Many scientists thought that time was important in the fossilization of resin … estimated as taking between 2 and 10 million years. However, it now appears that many more factors are involved" (p. 8).

There are many clear color photos of amber samples containing lizards, insects and their droppings, plants, and pollen. Several excellent pages of keys are provided to identify specific entombed insects. Other photos show valuable artwork and jewelry carved from amber over the ages. The Biblical frankincense and myrrh are identified as an aromatic form of resin (p. 8).

An active forgery market exists for the sale of insects in amber. One famous example, the "Piltdown fly," was not exposed for a century (p. 10). Such samples are prepared by drilling into amber and inserting insect remains. Another technique is to slice the material, insert an interesting insect, then glue it back together. Amber itself can also be faked with celluloid, glass, or plastic. Simple at-home tests are described for verifying true amber (p. 14).

Topics covered in the book include amber's physical properties, internal DNA recovery from entombed insects, and the worldwide distribution of amber. This is a beautiful book and is useful when read through a creationist lens.

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A Genesis Model for the Origin, Variation, and Continuation of Human Populations

Joel David Klenck*

Abstract

A model is presented based on a comprehensive analysis of Biblical references for the origin, variation, and continuation of human populations. This paradigm is compared to a breadth of paleontological, bioanthropological, and archaeological evidence regarding human origins. The model provides a more comprehensive explanation for the array of human origins data, especially the (1) alleged evidence for the greater antiquity of anatomically modern human bones, (2) the temporal coexistence of modern and non-modern human populations such as *H. erectus* and Neanderthals, (3) variation in the morphological traits of human populations, and (4) the continuation of only modern human populations or *Homo sapiens sapiens* into the present Holocene period.

Summary of Human Populations According to Genesis

The Bible states that Adam and Eve were created on the sixth day of Creation Week (Genesis 1:26–27; 2:7–8, 15–25). They had children (Genesis 4:1–2, 25; 5:3–4). These children had descendants (Genesis 4:17–23, 26; 5:6–32). As the descendants of Adam began to "multiply on the face of the earth," the sons of God took the daughters of men as wives (Genesis 6:1–2). Their offspring were the Nephilim (Genesis 6:4–5). Because the "evil of man was great on the earth" and "every imagination of the thoughts of his heart [was] only evil all the day long," God decided to destroy all mankind and terrestrial animals on the earth (Genesis 6:5–7). God selected Noah, his wife, their three sons, and the sons' wives to build an ark and to store two or seven of each animal kind on the ark in order to survive a pending worldwide flood (Genesis 6:13–7:10, 13–16). Noah was just and righteous and walked with God (Genesis 6:8–9). Noah was also a direct patrilineal descendant of Adam (Genesis 5:1–32) and perfect in his generations (Genesis 6:9). The Flood commenced. All humans, Nephilim, and terrestrial animals outside the ark perished (Genesis 7:21–23). The Flood stopped, the floodwaters abated, and Noah and his family left the ark along with the animals. The sons of Noah—Shem, Ham, and Japheth—and their wives had children and began to repopulate the earth (Genesis 10:1–32).

The Nephilim in Genesis 6

Genesis 6 discusses the emergence of the Nephilim [הנפלים]. Genesis 6:4–5 states:

> The Nephilim were in those days, and also afterwards, when the sons of God came in to the daughters of men, and they bore to them—they were the heroes, from ancient times, the men of name. And Jehovah saw that the evil of man was great on the earth, and every imagination of the thought of his heart was only evil all the day.

The account of the Nephilim has two major controversial themes. The first is the identity of the sons of God. One position holds that the sons of God

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represented angels sent to protect men. These angels abandoned their responsibilities and had children with the female descendents of Adam (Boice, 1982, pp. 244–249). Variations of this explanation include that fallen angels or possessed humans had relationships with these women (Morris, 1976, p. 166). Another, more symbolic, interpretation is that the sons of Seth took the daughters of Cain as wives (Schaff, 1977, p. 303; Schaeffer, 1972, p. 126).

The first position is the more literal understanding and therefore Biblically correct. The term "sons of God" [בני האלהים] is used only to describe angels throughout the Bible (Job 1:6; 2:1; 38:7). The punishment for this angelic transgression was that the sons of God were bound in chains of darkness in hell until Judgment Day (2 Peter 2:4–5; Jude 6–7).

The second controversy involving the Nephilim concerns their identifying characteristics, especially the inference of gigantism. Genesis 6 does not state that the Nephilim were giants. Instead, a later report in Numbers 13:32–33 is used to qualify the Nephilim as giants.

In this latter report, after Moses and the children of Israel left Egypt, God told Moses to send out twelve spies to perform a thorough reconnaissance of the land of Canaan (Numbers 13:1–20). The spies completed their mission and returned to give a report (Numbers 13:21–26). The reconnaissance team reported that the land was good and the cities were walled and described the geographical location of the various nations in Canaan (Numbers 13:27–29). At the conclusion of the report Caleb suggested that Israel should possess and overcome the country. Ten other spies disagreed (Numbers 13:30–31). At this time, the latter issued an evil report.

> And they sent out *an evil report of* [דבת] the land which they had searched to the sons of Israel, saying, "The land into which we traveled, to spy it out, is a land eating up its inhabitants. And all the people we saw in its midst were men of stature. And there we saw the Nephilim, the sons of Anak, of the Nephilim. And we were in our own eyes as grasshoppers and so we were in their eyes (Numbers 13:32–33).

The evaluation of the report by God and Moses was grim. The report was evil, slanderous, and it angered God (Numbers 13:32; 14:12, 36). God destroyed the spies that gave the evil report with a plague. "Even those men that did bring up the *evil report* [דבה] upon the land, died by the plague before the Lord" (Numbers 14:37).

When considering that the report was evil, the entirety of the report should be questioned, including the correlation between the sons of Anak and the Nephilim (Numbers 13:32; 14:36–37). Moreover, the association between the sons of Anak and the Nephilim is rejected by Scripture. First, with the exception of the evil report, there is no mention in the Bible of the Nephilim after the Flood. Second, since all the descendants of Adam, except for Noah and his family, perished in the Flood, no Genesis Nephilim could have survived into the Israelite era (Genesis 7:21–23). Third, there is no mention of the Anakim, Son's of Anak, or Rephaim, the usual translation for *giants*, before the Flood. The first reference to Rephaim occurs after the Flood, during the time of Abraham (Genesis 14:5; 15:20). Fourth, the sons of Anak were only three generations in duration: Arba, Anak, and his three sons—She'shai, Ahi'man, and Tal'mai—and were therefore not ancient (Joshua 14:12–15; 15:13–14; 21:11). Fifth, the sons of Anak were expelled from the land by Caleb and his sons (Joshua 15:13–14; Judges 1:20). Sixth, the Anakim were utterly destroyed by Joshua and his forces in Israel and had to survive in Gaza, Gath, and Ashdod (Joshua 11:21–22). Finally, other verses that mention the Anakim—and are not described as an "evil report"—refer to them as Rephaim [רפאים], the common and correct translation for *giants* throughout the Bible (Deuteronomy 1:28; 2:11, 20; 9:2). Throughout the Torah, others are also described as being tall in stature, giants, or Rephaim. These include the Emim, Zamzummim, King Og of Bashan, and Goliath and his sons. None of these individuals are described as Nephilim (Deuteronomy 2:11, 20; 3:11–13; Joshua 13:12; 2 Samuel 21:16–22; 1 Chronicles 20:4–8).

To sum up, it is Biblically impossible that the sons of Anak, with their gigantism, were from the Nephilim. An evil report was made by ten spies, which described the tall stature of the sons of Anak and associated them with the Nephilim (Numbers 13:32–33). This report was rejected by God, Moses, Caleb, and Joshua and caused God's judgment, and the subsequent death of the spies by a plague (Numbers 14:1–38). Outside this evil report, the equation of gigantism with the Nephilim is incongruous with Biblical references.

This evil report, for which the spies were executed by God in a plague, forged the association between the Nephilim in Genesis 6:1–5 and gigantism. This association, made in the milieu of evil, which brought the wrath of God, has been used to falsely define inerrant Scripture and has so influenced the modern Biblical lexicon that in most English translations Nephilim in Genesis 6 is erroneously and wrongly translated as giants. Furthermore, the evil report of the spies in Numbers 13:32–33 falsely equated the tall sons of Anak with the Nephilim, terrifying the Israelites by incorrectly giving these post-Flood sons of Anak attributes of ancient evil, physical prowess, legendary renown, and pre-Flood ancestry. This evil report has continued to influence the church and synagogues today, where scholars have looked for or expected giants among the descendants of Adam before the Flood, when there were in fact no giants but the true Nephilim: human-

like populations that displayed physical prowess, a penchant for continuous evil, and a culture focused on valor, conflict, and self-aggrandizement. As gigantism is not one of the traits of the Nephilim, we must examine the true qualities of the Nephilim as reported in Genesis 6:1–5.

The name *Nephilim* is a derivation of the verb *naphal* [נפל] or he/it fell (Genesis 6:4). Hence, Nephilim is similar to the English equivalent of saying "the fallen ones" or "the fallen." This name separates these populations from direct descendents of Adam [אנשים], who were not related to or genetically impacted by the sons of God.

The references to the Nephilim that they "were in those days, and also afterwards" [בימים ההם וגם אחרי־כן] and being "from ancient times" [מעולם אשר] is telling (Genesis 6:4). That the Nephilim were from ancient times is a key statement dating the Nephilim to before the Flood. This phrase also provides a counter weight to those who wish to exploit the phrase that "the Nephilim were in those days, and also afterwards" to mean that these populations survived the Flood and exist with us today. The author of Genesis is referring to the previous verse in 6:1, where the first emergence of the Nephilim occurred "when men began to multiply on the face of the earth" (Genesis 6:1). The author then prevents the "and also afterwards" statement from being interpreted too broadly by stating that the Nephilim were dated to "ancient times" or "from old." The author of Genesis is stating that there were at least two periods during ancient times, before the Flood, that the Nephilim flourished. The first period (Genesis 6:1) occurred "when men began to multiply on the face of the earth"; the later period (or periods) occurred after this initial floruit: "and also afterwards" (Genesis 6:4). All periods of Nephilim prominence occurred before the Flood.

The Nephilim were heroes or *hagiborim* [הגברים] (Genesis 6:4). The word has several connotations: success in battle, extreme bravery, and physical combat. The Nephilim were also "the men of name" [אנשי השם] (Genesis 6:4). This is a phrase that is commonly and correctly translated as men of renown or roughly "famous." The author makes it clear that the Nephilim had tremendous reputation in the ancient world. That the Nephilim were both heroes and men of renown clearly indicates that these populations had tremendous physical prowess, which when tested, resulted in success and the aggrandizement of their personal reputations.

The Nephilim were humans (Genesis 6:4) but different from preceding human populations because of their unique ancestry, physical abilities, actions, and tremendous reputations that resulted from their acts. Hence, the clear characteristics that made the Nephilim different were: (1) their appearance, in that they could be differentiated from the original descendants of Adam; (2) their physical power and ability; and (3) their personas, in that they sought and accomplished actions of tremendous valor.

The Nephilim are also associated with intense and continuous evil in that "every imagination of the thought of his heart was only evil all the day" [כל־היום: וכל־יצר מחשבת לבו רק רע] (Genesis 6:5). The phrase suggests that all men and the Nephilim were evil. However, that this mention of evil immediately follows the description of the Nephilim as heroes and men of name, casts an ominous shadow over their populations and qualities.

The Nephilim and all men outside the ark were annihilated in their entirety by the Flood (Genesis 7:21, 23). Furthermore, the author of Genesis goes into tremendous detail documenting that Noah was a direct patrilineal descendant of Adam (Genesis 5:1–32). Finally, the Bible states that Noah not only found grace in the eyes of the Lord, was a just man, and walked with God, but he was also "perfect in his generations" [בדרתיו תמים היה], another telling statement as to Noah's direct genetic lineage from Adam (Genesis 6:9).

To sum, the Nephilim were the products of angelic and human couplings, evil acts that resulted in the damnation of their progenitors. Nephilim populations flourished at least twice before the Flood: as the descendants of Adam began to populate the earth and afterwards. Their populations were human, yet different and fallen. Their physical prowess enabled their success as they pursued aggressive acts that furthered their reputation. However, their heroism was not oriented toward altruism but toward their own vanity and search for reputation, as they schemed and successfully practiced continuous acts of evil. Nephilim populations were extirpated in their entirety by the Flood and most likely did not contribute to the genetic heritage of Noah and his descendants. Noah was a direct patrilineal descendant of Adam and untainted by the evil ancestry or acts of the Nephilim.

A Genesis Model for the Origin, Variation, and Continuation of Human Populations

According to Genesis, all human populations today are descended from Noah (Genesis 9:18–29; 10:1–32). Hence, all current populations of *Homo sapiens sapiens* or anatomically modern humans descend from Noah. If Noah was a direct patrilineal descendant from Adam (Genesis 5) and perfect in his generations (Genesis 6:9), being untainted by the fallen ancestry of the Nephilim, we should expect to find skeletal remains of *Homo sapiens sapiens* or anatomically modern humans in the earliest paleoanthropological contexts.

According to Genesis, the Nephilim emerged "as men began to multiply on the face of the earth" (Genesis 6:1) and flourished at least twice, or "in those

days, and also afterwards" (Genesis 6:4); before they were annihilated in their entirety by the Flood of Noah (Genesis 7:21–23). According to the Biblical model, populations of direct descendants of Adam, Nephilim, and hybrids of these two populations coexisted until the Noachian deluge, which extirpated "all mankind" not on the ark, including all Nephilim populations (Genesis 7:21). According to Genesis, only Noah, his sons, and their wives survived (Genesis 8:18). God commanded them to multiply and fill the earth (Genesis 9:1), which they did (Genesis 9:18–29; 10:1–32).

The Genesis model of the origin, variation, and continuation of human populations is straightforward. At the earliest periods, we should expect to find humans similar to the populations of today that are anatomically much like ourselves, or *modern*. Later, we should expect anatomically modern humans, populations of Nephilim, and most likely hybrids between these populations coexisting on earth. During this time there should be at least two periods of fluorescence, when Nephilim populations thrived before their total global annihilation by the Flood catastrophe. After the Flood, we should see the emergence and repopulation of earth by only anatomically modern humans, which comprise our kind today. The scheme of the Genesis model for the origin, variation, and continuation of human populations is shown in Table I.

If today's anatomically modern human populations, *Homo sapiens sapiens*, are the direct descendants of Adam through Noah, then we should expect to find our suite of morphological traits in the earliest paleoanthropological contexts. Moreover, those human populations with morphological or genetic characteristics that differ from those exhibited by anatomically modern humans reflect (1) Nephilim populations or (2) hybrid offspring genetically influenced by the Nephilim. Therefore, all human populations with characteristics outside those of anatomically modern humans—including but not limited to some specimens attributed to *H. habilis* and *H. rudolfensis* and most remains attributed to *H. ergaster*, *H. erectus*, *H. antecessor*, *H. heidelbergensis*, *H. neanderthalensis*, and *H. floresiensis*—should be interpreted as Nephilim or populations genetically influenced by the Nephilim.

To test the Genesis model, there should be skeletal remains in early paleoanthropological contexts, which are more comparable to anatomically modern humans or *Homo sapiens sapiens* than non-modern populations. These remains should be associated with the earliest radioisotope dates, fauna, flora, or other indices that show these remains are older than assemblages from non-modern human populations.

Traditionally, evolutionists have claimed that human skeletons in early contexts that have a combination of traits similar to and unlike those of *Homo sapiens sapiens* represent our ancestors. However, in light of the Genesis model and the alleged remains of anatomically modern humans in extremely early

Table I. Genesis model for the origin, variation, and continuation of human populations.

Biblical Periods & Events	Populations in Genesis	Linnaean Classifications	Other Nomenclature
Modern times After the Flood	Direct descendants of Adam	*Homo sapiens sapiens*	Anatomically modern humans
Flood of Noah After that In those days As men began to multiply on the face of the earth	Direct descendants of Adam; Nephilim; and offspring of both	*Homo sapiens sapiens*, *H. habilis*, *H. rudolfensis*, *H. ergaster*, *H. erectus*, *H. antecessor*, *H. heidelbergensis*, *H. neanderthalensis*, *H. floresiensis*, and potentially other populations.	Anatomically modern humans and non-modern humans
Soon after expulsion from Eden	Direct descendants of Adam	*Homo sapiens sapiens*	Anatomically modern humans
Sixth Day of Creation Week	Adam and Eve		

contexts, these same assemblages may conversely suggest the greater antiquity of *Homo sapiens sapiens*. Non-modern human populations, such as *H. heidelbergensis*, with a combination of traits similar to and unlike those of *Homo sapiens sapiens*, would be descendants, not ancestors, of anatomically *modern* humans.

To test this Genesis model, we must evaluate whether the suite of characteristics found in non-modern humans resides in populations of anatomically modern humans. For example, if there are human populations living today that exhibit the set of traits found in *H. neanderthalensis or H. erectus*, this Genesis model would be severely challenged. Also, this Genesis model must be tested to ensure that other variables, besides the inherited genetic traits of the Nephilim, are not responsible for the suite of characteristics in non-modern human assemblages. For example, if it could be shown that great age, diseases such as rickets or syphilis, or mechanisms like strenuous chewing, or a combination therefore, could explain the range of traits found in non-modern humans, then this Genesis model would be disputable. The final test of this Genesis model is an evaluation of non-modern human populations, their culture, and behavior, to determine if they are similar to the description of the Nephilim in Genesis 6. If there is a stark difference between the Biblical description of the Nephilim in Genesis 6 and non-modern human populations and assemblages, this Genesis model would be in doubt.

Skeletal Remains Resembling Anatomically Modern Humans in Early Contexts

Evidence exists of anatomically modern human populations in contexts preceding non-modern (i.e., *H. habilis*; *H. ergaster; H. erectus; H. heidelbergensis; H. neanderthalensis*; *and H. floresiensis*) humans. Lubenow (1992, 2004) and Cremo and Thompson (1993, 1996, 1998), Christian and Hindu scholars, respectively, were the first to promulgate alleged modern human bones found in early paleoanthropological contexts (Table II).

Richard Leakey and W. W. Howells rejected the assertions of Lubenow (1992, 2004) and Cremo and Thompson (1993, 1996, 1998). However, these researchers derived their ideas from the work of Howells, the Leakey family, and others, who asserted that remains resembling anatomically modern humans were found in early contexts at their excavations. These remains were carefully mitigated and their initial proveniences and date ranges were cautiously made relative to current archeometric assumptions and methodologies. Finally, all remains were preserved; casts were made of each that can be readily obtained for future comparative analyses.

A distal humerus fragment [KNM KP 271] from Kanapoi, Kenya, was discovered in 1965 by W. W. Howells, professor of anthropology at Harvard, and Bryan Patterson, the Agassiz Professor of Vertebrate Paleontology at Harvard University. Howells pioneered the use quantitative methods in biological anthropology.

The consensus for the date of this specimen is between 3 and 3.5 mya and is based on the color, hardness, degree of mineralization of this and related artifacts, its similar preservation to other specimens under the capping lava, potassium-argon dates from the lava layer between 2.9 and 2.5 mya, paleomagnetic analyses showing reverse polarity, which was correlated to Matuyama Reverse Epoch and dated to around 2.5 mya, and associated faunal remains that correlated to a date range between 4 and 4.5 mya (Patterson and Howells, 1967; Senut, 1979, p. 113).

Later, Henry McHenry, a student of Howells, and Robert Corruccini reanalyzed the specimen and subsequently obtained sixteen different measurements and compared them to anthropoid apes, monkeys, modern humans, the robust australopithecines from Kromdraii [TM 1517e] and East Rudolf [KNM ER 739]. These researchers suggest that the distal humerus fragment, KNM KP 271, from Kanapoi resemble those of anatomically modern humans or *Homo sapiens sapiens*.

> There are individuals in our sample of [modern] man on whom measurements … of Kanapoi Hominoid I can be duplicated almost exactly (Patterson and Howells, 1967, p. 66).
>
> A humerus fragment has been found at Kanapoi that is almost five million years old yet almost indistinguishable in shape from many modern humeri (McHenry, 1973, p. 740).
>
> The hominid fossil from Kanapoi resembles *Homo sapiens* very closely (McHenry and Corruccini, 1975, p.227).
>
> The Kanapoi fossil is quite close to *Homo*, especially the Eskimo sample (McHenry and Corruccini, 1975, p. 235).
>
> The Kanapoi humerus is barely distinguishable from modern *Homo* (McHenry and Corruccini, 1975, p. 240).
>
> The phenetic position of the Kanapoi fossil is more surprising for the fact that it is so distant from the other fossil hominids (McHenry and Corruccini, 1975, p. 240).

A team of researchers, led by Jean Chavaillon, retrieved a distal humerus [Gombore IB 7594] from the Gombore site, 55 kilometers south of Addis Ababa, Ethiopia (Chevaillon et al, 1977). The dates for this artifact, between 1.5 and 1.7 mya, were based on potassium-argon dates of 1.5 mya for the basalt layer at Gombore and the corresponding lithic assemblage at Gombore, which was similar to upper Bed I or lower Bed II at Olduvai Gorge in Tanzania (Senut, 1979). The latter assemblage is dated to 1.7 mya via radiometric dates, paleomagnetic analyses, associated fauna, and

Table II. Possible remains of anatomically modern humans in early paleoanthropological contexts. Columns exhibit the original excavator(s), location, alleged date range, contextual information, comparative skeletons, and cited publications.

Excavator	Locale	Skeletal Part	Date Range	Dating Methods	Comparison Material	Studies
Bryan Patterson & W.W. Howells	Kanapoi, Kenya	Distal Humerus [KNM KP 271]	3–3.5 mya	Color, hardness, degree of mineralization, preservation similar to other specimens under capping lava; potassium-argon exhibited dates between 2.9 and 2.5 mya; paleomagnetic tests showed a reverse polarity correlated to Matuyama Reverse Epoch around 2.5 mya (Patterson and Howells, 1967); faunal remains associated with Kanapoi dated between 4 and 4.5 mya (Senut, 1979, p.113).	Modern human, chimpanzee, and robust australopithecine: Kromdraii TM 1517 (Patterson and Howells, 1967). Anthropoid apes (KNM-RU 2036 AH; KNM-RU 2097; KNM-FT 2751), monkeys, modern humans, the robust australopithecines: Kromdraii TM 1517 and East Rudolf KNM ER 739 (McHenry and Corruccini, 1975; Oxnard, 1975).	Patterson and Howells, 1967; Senut, 1979, p. 113; McHenry, 1973; McHenry and Corruccini, 1975; Oxnard, 1975.
Jean Chavaillon	Gombore, Ethiopia	Distal Humerus [Gombore IB 7594]	1.5–1.7 mya	Potassium argon dates from basalt older than 1.5 mya; Oldowan lithic assemblage associated with site similar to upper Bed I or lower Bed II at Olduvai in Tanzania dated to 1.7 mya by potassium-argon methods (Senut, 1979).	Great apes, modern humans, Plio-Pleistocene hominids including KNM KP 271 (Senut, 1979, 1981a, 1981b).	Chevaillon et al., 1977; Senut, 1979, 1981a, 1981b.
G.W. Barlow & Robert Broom	Sterkfontein, South Africa	Distal Femur [Sterkfontein TM 1513]	2.2–3 mya	Associated with australopithecine remains (Broom, 1951, p. 44); in sedimentary rock deposits dated between 2.2 and 3.0 mya (Groves, 1989, p. 198).	Cercopithecid monkeys, African apes, gracile and robust australopithecines, and modern man (Tardieu 1981, pp. 77–79).	Broom, 1951; Zuckerman, 1954; McHenry, 1972; Tardieu, 1981.
Juma Gitau & Louis Leakey	Kanam, Kenya	Mandible	1.7–2 mya	Associated with teeth from Mastodon and *Deinotherium* (Oakley et al., 1977, pp. 166, 169); encased in same block of travertine as fauna and rudimentary pebble tools with preservation identical to Lower Pliestocene fauna (Leakey, 1960, pp. 202–203); flourine, nitrogen, and uranium content tests (Oakley, 1974, 1975).	*Homo sapiens sapiens*, Neanderthals, *H. erectus*, australopithecines (Keith, 1935, p. 163; Tobias, 1962, p. 345;1968, pp. 180–181).	Woodward et al., 1933; Broom, 1951; L. Leakey, 1960, 1972; Cole, 1975; Cooke, 1963; Tobias, 1962, 1968; Groves, 1989.

(table continues on next page)

Table II (continued)

Excavator	Locale	Skeletal Part	Date Range	Dating Methods	Comparison Material	Studies
Louis Leakey	Kanjera, Kenya	Cranium	400–700 kya	Associated with fauna from 700–400 kya similar to Bed IV at Olduvai Gorge (Cooke, 1963, p. 629); Lithic assemblage comprising Chellean tools and fauna equivalent to Bed IV at Olduvai Gorge (Leakey, 1960, p. 204); flourine, nitrogen, and uranium content tests (Oakley, 1974, 1975).	Australopithecines, Neanderthals, *H. erectus*, and *Homo sapiens sapiens* due to "no trace of a bony brow-ridge above the eyes" (L. Leakey 1960, p. 203; Groves 1989, p. 291).	Woodward et al., 1933; Broom 1951; L. Leakey, 1960, 1972; Cole, 1975; Cooke, 1963; Groves, 1989.
B.A. Wood	Kooba Fora, Eastern shore of Lake Turkana, Kenya	Talus [ER 813]	1.5–1.9 mya	Found between KBS Tuff (2.6 mya) and overlying Koobi Fora Tuff (1.57 mya—Wood, 1974, p. 135; KBS Tuff dated between 2.6 and 1.6 mya (Fitch and Miller, 1970; Curtis et al., 1975); samples in KBS Tuff of normal polarity associated with Gauss Normal Epoch between 2.48 and 2.92 mya (Brock and Isaac 1974, p. 346); pig teeth below KBS Tuff similar to Ethiopian pigs dated to 2 mya (Cook, 1976).	Modern humans, gorillas, chimpanzees, arboreal apes (Wood, 1974, p. 135, 1976, pp. 500–501); Modern humans and australopithecines (Oxnard, 1975, p. 121).	Wood, 1974,1976; Oxnard, 1975; Fitch and Miller, 1970; Curtis et al., 1975; Brock and Isaac 1974; Cook 1976
Hans Reck	Olduvai, Kenya	Skeleton	1.15 mya	From the upper section of Bed II at Olduvai, a volcanic tuff of buff color with a reddish hue at the higher levels, with no evidence of being a refilled deposit from a later bed, the context was associated with the fossilized remains of *Elephas antiquus recki* (Hopwood 1932, pp. 192–193); the remains were adhered to matrix along with faunal remains that had to be retrieved using picks, chisels, and hammers, 3–4 meters lower than the plain and rim of the Gorge (MacCurdy 1924, p. 423); the compressed and distorted skeleton indicated that much sediment had surmounted the skeleton after deposition (Dietrich 1933, pp. 299–303); Bed II comprises radiometric dates which range from 1.15 to 1.70 mya (Oakley et al., 1977, pp. 166–169). Since Reck's skeleton was found in upper Bed II contexts, an earlier date is more likely.	Australopithecines, Neanderthal, *H. erectus*, and *Homo sapiens sapiens*—the cranium resembles a modern human having a vertical forehead with no browridge, rounded occipital, high domed cranium, chin, gracile structure, flaring parietals, and no midfacial prognathism (MacCurdy 1924, p. 423; Goodman 1983, p. 107).	Reck, 1914, 1926, 1933; Hopwood, 1932; MacCurdy, 1924; Dietrich, 1933; Oakley et al., 1977; Goodman, 1983.
Lenore Selenka	Trinil, Java	3rd molar	1–1.9 mya	Geologists divided over dates, from recent to Pliocene; associated with butchered animal bones, charcoal, and hearths (Bowden 1977, pp. 134–135).	Anatomically modern humans, *H. erectus* (MacCurdy 1924, p. 316).	Keith, 1911; MacCurdy, 1924; Bowden, 1977.

(table continues on next page)

Table II (continued)

Excavator	Locale	Skeletal Part	Date Range	Dating Methods	Comparison Material	Studies
Zuckerman & McHenry	Kromdraai, South Africa	Ulna & Humerus [Kromdraai TM 1517]	1–1.8 mya	Radiometric dates between 1–1.8 mya (Tobias, 1978, p. 67; Groves, 1989, p. 198).	Anthropoid apes, *Homo sapiens sapiens*, robust australopithecines (Broom, 1950, p. 57; Zuckerman, 1954, pp. 310–311; McHenry, 1972, p. 95).	Broom, 1951; Zuckerman, 1954; McHenry, 1972; Tobias, 1978; Groves, 1989).
John Harris	Kooba Fora	Proximal and distal femur [ER 1481]	2–2.9 mya	Associated with extinct elephant bone fragments, and parts of tibia and fibula from same individual, in deposits below KBS Tuff (R. Leakey, 1973a, 1973b).	Modern humans, australopithecines, *H. erectus* (R. Leakey 1973b, p. 821–828; Wood 1976, p. 502).	R. Leakey 1973a, 1973b; Wood 1976; Tardieu 1981.
John Harris	Kooba Fora	Femur [ER 1472]	2–2.9 mya	In contexts below KBS Tuff, associated in mineralized contexts similar to other fossils in context (R. Leakey, 1973a, 1973b).	Modern humans, australopithecines, *H. erectus* (R. Leakey 1973b, pp. 821–828; Wood 1976, p. 502).	R. Leakey 1973a, 1973b; Wood 1976; Tardieu 1981.
Michael Day	Kooba Fora	Clavicle [OH 48]	1.76 mya	Day, 1965, p. 178; Lubenow 2004, p. 340; Klein 1999, p. 120.	Day, 1965, p. 178; Lubenow, 2004, p. 340; Klein, 1999, p. 120.	Day, 1965.
Craig Feibel	Kooba Fora	Cranium & Dentition [KNM ER 1590]	1.85 mya	Feibel et al., 1989, p. 613; Lubenow 2004. p. 340.	Feibel et al., 1989:613; Lubenow 2004, p. 340.	Feibel et al., 1989, p. 613.
Meave Leakey	Kanapoi, Kenya	Distal Humerus [KNM KP 271]	3–3.5 mya	M. Leakey et al., 1995; M. Leakey et al, 1998; Lubenow 2004, p. 340.	M. Leakey et al., 1995; M. Leakey et al., 1998; Lubenow 2004, p. 340.	M. Leakey et al., 1995; M. Leakey et al., 1998.

other methods (e.g., Oakley et al. 1977, pp. 166–169).

Brigitte Senut, from the Muséum National d'Histoire Naturelle in Paris, completed several comparative studies of the specimen, with other humeri from apes, modern humans, and Plio-Pleistocene hominids. Chavaillon et al. (1977, p. 962) suggested Gombore IB 7594 is similar to humeri from anatomically modern humans by stating that "in the lateral view, the bone very much resembles *Homo sapiens sapiens*." Senut (1981b, p. 91) also concluded that "Gombore IB 7594, which was primitively attributed to the genus *Homo* … cannot be differentiated from a typical modern human."

In 1936, G. W. Barlow and Robert Broom retrieved a distal femur [Sterkfontein TM 1513] from Sterkfontein limestone quarry in South Africa. The artifact is dated between 2 and 2.3 mya, as it was retrieved from sedimentary rock deposits with radiometric dates between 2.2 and 3.0 mya and associated with australopithecine remains (e.g., Groves 1989, p. 198; Broom 1951, p. 44).

The specimen was studied by various researchers (e.g., Broom 1951; Zuckerman 1954; McHenry 1972; Tardieu 1981). Several investigators commented on the specimen's similarity to modern humans. Zukerman (1954, p. 310) stated that it "shows a resemblance to the femur of *Homo* which is so close as to amount

to practical identity," and Tardieu (1981, p. 77) said the femur was "characteristic of modern man."

In 1932, Louis Leakey and Donald MacInnes retrieved five human skulls, a femur, and a lithic assemblage with stone axes at Kanjera, on the south shore of Lake Victoria in Kenya. The skeletal assemblage was dated between 400 and 700 kya based on its associated fauna, which is similar to Bed IV at Olduvai Gorge; a lithic assemblage comprising Chellean tools similar to Bed IV at Olduvai; and flourine, nitrogen, and uranium content tests (H. B. S. Cooke 1963; Leakey 1960; Oakley, 1974, 1975).

That same year, Juma Gitau, an excavator working for Louis Leakey, retrieved a mandible in Kanam, Kenya (near Kanjera). The Kanam mandible is dated between 1.7 and 2 mya based on its association with Mastodon and *Deinotherium* faunal remains, in that it was encased in the same block of travertine and exhibited similar states of preservation as the aforementioned Lower Pleistocene fauna; its association with rudimentary pebble tools; and flourine, nitrogen, and uranium content tests (Oakley et al., 1977; Leakey, 1960; Oakley, 1974, 1975).

Louis Leakey and the Royal Anthropological Institute evaluated the specimens from Kanam and Kanjera. Both the chair of the Institute, Arthur Woodward, and Leakey claimed the specimens were similar to those of anatomically modern humans. Regarding the Kanjera skulls and femur, Leakey (1960, p. 203) stated that "the front part of the skull is preserved, in a damaged condition, in two of the specimens, and from this we can see that there was no trace of a bony brow-ridge above the eyes. Instead we find a very small and simple form much as in a child, but certainly of the *Homo sapiens* type." Woodward et al. (1933, p. 477) noted that the Kanjera skulls have "no characteristics inconsistent with the reference to the type *Homo sapiens*." Regarding the Kanam mandible, Woodward et al. (1933, p. 478) stated that "with the possible exceptions of the thickness of the symphysis, the conformation of the anterior internal surface, and what seems to be a large pulp-cavity of the first right molar tooth, the Committee is not able to point to any detail of the specimen that is incompatible with its inclusion in the type of the *Homo sapiens*." Broom (1951, p. 13) concluded, "I am quite satisfied that Leakey found these remains where he says he found them, and that they prove modern man is far older that a few English scientists had thought—perhaps even as old as the Lowest Pleistocene."

In 1973, a paleontologist from the National Museum of Kenya, John Harris, retrieved a proximal and distal end of a femur [ER 1481] along with associated fragments of a tibia and fibula. Near this site, Harris retrieved another distal femur fragment [ER 1472]. Both specimens were found near the eastern shore of Lake Turkana, in Koobi Fora, in contexts below the KBS Tuff and possessed characteristics that were similar to those of anatomically modern humans. Leakey (1973b, pp. 828, 821) acknowledged that "it is quite clear, however, that these femurs are unlike those of *Australopithicus*, and astonishingly similar to those of modern man," and that they are "almost indistinguishable from those of *Homo sapiens*." Leakey (1973a, p. 450) also observed:

> "When the femur is compared with a restricted sample of modern African bones, there are marked similarities in those morphological features that are widely considered characteristic of modern *H. sapiens*. The fragments of tibia and fibula also resemble *H. sapiens*."

In 1974, B. A. Wood described a unique ankle bone or talus retrieved in Koobi Fora, in a deposit between the KBS Tuff and Koobi Fora Tuff, which enabled the specimen to be dated between 1.5 and 1.9 mya. After a comprehensive analysis, Wood (1974, p. 135) remarked on the similarity of the KNM-ER 813 to tali of anatomically modern humans: "In all the variates, the fossil aligned with the modern human tali." He also observed that "[KNM-ER 813 is] not significantly different from the tali of modern bushmen" (Wood, 1976, p. 501).

In 1913, Hans Reck led a team from the University of Berlin searching for human remains at Olduvai Gorge in German East Africa, which is now Tanzania. Surveying the north slope of the gorge, the team found a human skeleton encased in rock, which they excavated using small hammers and picks. Having divided Olduvai Gorge into five beds, the skeleton in question originated from Bed II dated at around 1.15 mya. However, the skeleton was unique and comprised traits that resembled modern humans, including a vertical forehead with no browridge, rounded occipital, high domed cranium, chin, gracile structure, flaring parietals, and no midfacial prognathism (Reck, 1914, 1926, 1933; MacCurdy, 1924; Goodman, 1983). "Judging from the photograph of the skeleton still in situ, the man of Oldoway gorge did not belong to the Neandertal, but rather to the Aurignacian [Cro-Magnon, *Homo sapiens sapiens*] type" (MacCurdy 1924, p. 423). Related to this Goodman (1983, p. 107) declared, "almost beyond question that the skeleton of a human being found by Professor Reck in 1913 is the oldest authentic skeleton of *Homo sapiens*."

From 1907 to 1908, Professor Lenore Selenka from the University of Munich, conducted a multidisciplinary excavation in Java to verify Dubois's previous claims about Java man. Her team was divided on the age of the excavated remains, the original Java fossil assemblage by Dubois. In addition, a third molar was found that was very similar to modern human and associated with butchered animal bones, hearths, and charcoal. The tooth was problematic.

> "The Selenka expedition of 1907–1908 … secured a tooth which is said by Walkoff to be definitely human. It is a third molar from a neighboring stream bed and from deposits older (Pliocene) than those in which *Picanthropus erectus* was found. Should this tooth prove to be human, *Pithecanthropus* could no longer be regarded as a precursor of man. Instead it would simply give us the cross section of a different limb of the primate tree whose branches now represent the various types of Hominidae (MacCurdy, 1972, p. 316)."

In 1938, Robert Broom acquired a radius and ulna [TM 1517] from Kromdraai, South Africa. Although the remains were from early contexts conventionally dated between 1 and 1.8 mya, several researches believed the remains belonged to anatomically modern humans (Broom, 1950; Zuckerman, 1954; McHenry, 1972). Zuckerman (1954, p. 310) concluded that the TM 1517 displayed "a very close resemblance to the humerus of Homo sapiens," and McHenry (1972, p. 95) suggested that the morphometric analysis of TM 1517 is "within the human range."

Finally, there exist a series of remains, which Lubenow states represent those of anatomically modern humans despite their early provenience in paleoanthropological sites (Lubenow 2004, p. 340). These include the clavicle [OH 48] from Koobi Fora (Day, 1965, p. 178; Klein, 1989, p. 120); the cranium fragments and dentition [KNM-ER 1590] from Koobi Fora (Feibel et al., 1989, p. 61); and the proximal and distal tibia fragments [KNM-KP 29285] from Kanapoi, Kenya (M. Leakey et al., 1995; M. Leakey et al., 1998).

The above summary is only a preliminary analysis. Required is a definitive morphometric and morphological analysis comparing the above remains to (1) *Pongidae* (chimps, gorillas, and orangutans), (2) robust and gracile australopithecines, (3) specimens clearly attributed to *H. habilis*, *H. erectus*, Neanderthals, and other non-modern specimens, and (4) anatomically modern humans or *Homo sapiens sapiens*. Post-cranial comparative specimens from non-modern humans should be ideally obtained from burials, where reasonable certainty could be established with regard to their association with non-modern human craniums. I have made a preliminary comparison. With regard to several specimens, such as KNM KP 271, the research looks very promising. If a comparative study indicates that a portion of the above remains resemble those of *Homo sapiens sapiens*, this will provide considerable support for the Genesis model, whose primary assertion is that our species was created first and therefore emerged before other non-modern human populations. The determination of similarities between the above specimens and *Homo sapiens sapiens* would also strengthen the correlation between non-modern humans, such as *H. erectus* and Neanderthals, and Nephilim populations.

Differences between Anatomically Modern and Non-modern Human Populations

There is a current theme among creationists who posit that there are no differences between anatomically modern humans or *Homo sapiens sapiens* and non-anatomically modern humans, which include but are not limited to several specimens attributed to *H. habilis* and *H. rudolfensis* and most bones associated with *H. ergaster*, *H. erectus*, *H. antecessor*, *H. heidelbergensis*, *H. neanderthalensis*, and *H. floresiensis* (Lubenow, 1999, 2004; Cuozzo, 1998; Mehlert, 1994; Beasley, 1992; Custance, 1975). They suggest that the range of traits of non-anatomically modern humans is within the variation of modern human morphology.

In addition, these researchers claim that alleged non-modern humans are modern human populations affected by diseases such as syphilis or rickets, the chewing of uncooked meat from childhood, or ages in excess of 200 years, as cited in Genesis (Lubenow, 2004; Cuozzo, 1998; Custance, 1975). To bolster his anthropological claims, Lubenow (2004, pp. 158, 187, 201) cites Scriptures such as "God said, Let Us make man in our image, in our likeness (Gen. 1:26), "From one man He made every nation of men, that they should inhabit the whole earth" (Acts 17:26), and "Therefore go and make disciples of all nations" (Matt. 28:19).

Lubenow (2004, pp. 158, 201) uses these verses to support "the unity, solidarity, and equality of the human family," "the absurdity of attempting to determine species distinctions in fossil humans," and the "insignificance" of the distinctions between modern and non-modern humans.

First, the theological arguments proposed by Lubenow seem incongruous with Scripture. The references in Matthew and Acts were after the Flood and refer to post-Flood human populations, direct descendants of Adam through Noah not impacted by the Nephilim. Genesis 1:26 does not contradict Genesis 6 or support Lubenow's assertion that there were no differences between Nephilim and non-Nephilim populations before the Flood. However, Genesis 6 does state that before the Flood of Noah, there were two different human populations: Nephilim and non-Nephilim. Nephilim populations were given a name that essentially meant "fallen" and were characterized by their physical power and ability, valor, reputation, and evil. Neither Lubenow, Cuozzo, nor Custance mention the Nephilim. It seems odd that the defining Biblical chapter on the differences between pre-Flood human populations is completely ignored by these researchers, who then claim Scriptural support for the alleged

lack of differences between human groups during this period.

Second, it is false that the range of traits possessed by non-modern humans fall within the range of characteristics exhibited by anatomically modern humans. Clear differences are evident in the range of traits that characterize *Homo sapiens sapiens* and other human populations (Table III, Figures 1–4). The morphological traits of non-modern human populations, such as a thick cranial and post-cranial skeletons, occipital bun, supraorbital torus, receding frontal, and absence of a chin are found in Neanderthals, *H. erectus*, and other populations outside *Homo sapiens sapiens*. The differences between anatomically modern and non-modern human populations are agreed upon by most evolutionists despite their differences over the taxonomic descriptions of non-modern groups. Ian Tattersall (2003) prefers to separate *H. habilis*, *H. rudolfensis*, *H. ergaster*, *H. erectus*, *H. antecessor*, *H. heidelbergensis*, *H. neanderthalensis*, while Wolpoff prefers to unify non-modern human taxon into fewer populations or classify *H. erectus* as a race of *H. sapiens* (Wolpoff, Zhi, and Thorne, 1984, pp. 465–466; Shipman, 1993, p. 34). Although Lubenow (2004, pp. 201, 338–353) alludes to the "insignificance" of the distinctions between modern and non-modern humans, he attributes lists of individual human remains to modern humans, Neanderthal, *H. erectus*, and other groups based on their morphological differences. The morphological differences between modern and non-modern humans are well known by biological anthropologists, exhibited in Table III and correlated with Genesis model.

Third, Lubenow (2004, p. 148) states that modern Tasmanian human populations, which were hunted into extinction in the nineteenth century, reflect *H. neanderthalensis* or *H. erectus* traits: "Their eyes were deep set, overhung by Neandertal-like brow ridges." Using this platform, Lubenow intimates that Neanderthals or *H. erectus* are within the range of modern humans. This suggestion is misleading. An observation of Tasmanian skeletons exhibit at most a slight elevation of their supraorbital torus, which differs widely from the robust and pronounced torii exhibited on Neanderthal craniums. Furthermore, all other traits on Tasmanian skeletons resoundingly match those exhibited by *H. sapiens sapiens*: Vertically angled foreheads, gracile cranial and post-cranial bones, chins, mandibular fossa, flaring parietals, brain cases that are wider than their zygomatic arches, rounded occipitals, gracile jaws, and other modern human traits (see Figure 1). Lubenow (2004) takes one trait in a Tasmanian skeleton that he incorrectly states resembles a non-modern human and

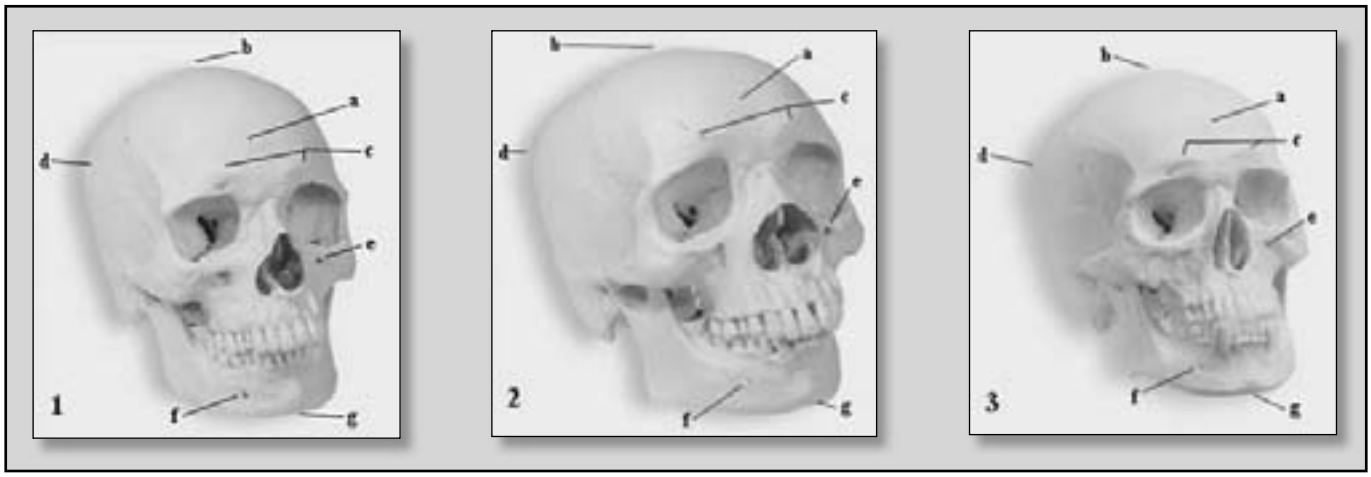

Figure 1. After the Flood only the descendants of Noah, a direct ancestor of Adam, "perfect in his generations" and not having any Nephilim ancestry, continued to exist. The Flood destroyed all Nephilim populations in their entirety throughout the world. The surviving direct descendants of Adam, through Noah, are represented by *H. sapiens sapiens* (our kind) or anatomically *modern* humans. Featured here are craniums of three major races of *H. sapiens sapiens* or modern humans: (1.1) European, (1.2) African, and (1.3) Asian, which, according to the Bible increasingly differentiated after the incident at Babel described in Genesis 11:1-9 (Also see the Tasmanian cranium in Figure 5). The photographs, from a lateral-anterior view, exhibit the characteristics of *H. sapiens sapiens:* (a) vertically angled frontal or forehead; (b) no sagittal ridge; (c) supraorbital torus that is absent or slight; (d) flaring or bulging parietal bones; (e) canine fossa beneath orbits; (f) mental foramen on each mandible; and (g) chin or mentum. For other characteristics of anatomically modern humans, please refer to Table 3.

Table III. Range of morphological traits in anatomically modern humans or *Homo sapiens sapiens* and non-modern humans comprising most skeletal assemblages attributed to *H. habilis*, *H. rudolfensis*, *H. ergaster*, *H. erectus*, *H. antecessor*, *H. heidelbergensis*, *H. neanderthalensis*, and *H. floresiensis* (expanded taxonomic definitions from Tattersall, 2003).

Biblical Differentiation	Direct Descendants of Adam (No Nephilim Ancestry)	Nephilim & Nephilim Ancestry
Linnaean Differentiation	Homo sapiens sapiens	Some specimens of *H. habilis* and *H. rudolfensis*; most specimens attributed to *H. ergaster*, *H. erectus*, *H. antecessor*, *H. heidelbergensis*, *H. neanderthalensis*, *H. floresiensis*, and potentially other populations.
Other Nomenclature	Anatomically Modern Humans	Non-modern Humans
Non-Defining Traits		
Cranial Capacity	700–2200 cc (Molnar, 1975)	600–1900 cc
Defining Characteristics: Cranium		
Frontal or Forehead	Vertical or Vertically Angled	Receding
Cranial Vault or Braincase	High, sides parallel, parietal bones bulge	Low, parietal bones angled from sagital summit of the cranium
Length of Cranium	Usually Truncated	Elongated
Median Sagittal Ridge	None to Slight	Slight to Pronounced
Supraorbital Torus or Brow-ridge	None to Slight. If slight, torus exists in two parts over each eye with a supraorbital notch dividing the individual torus and a v-shaped supraorbital trigone dividing the torus itself.	Pronounced. Usually forms continuous bar across the top of both orbits. If torus is divided over each orbit, it is robust and the supraorbital notch is absent.
Postorbital Constriction	No	Yes
Brain Case to Zygomatic Arch	Brain Case Wider	Brain Case Narrower
Parietals	Flaring or Bulging	Constricted
Occipital	Rounded	Angled with Bun or Torus Present
Nuchal area	Constricted	Extended
Cranium wall	Thin	Thick
Position of Face and Brain Case	Usually flat and angled beneath anterior part of cranium	Angled in midfacial region and is positioned forward of the anterior part of the cranium
Facial Morphology	Thin	Thick
Midfacial Prognathism	None to Slight	Pronounced
Canine fossa beneath orbits	Yes	No
Chin (Mentum)	Yes	No
Mental Foramen	Usually single foramen present	Absent or multiple small foramina present
Dentition	Gracile	Robust
Mandible (Jaw)	Gracile	Robust
Retromolar Space	Rare	Common
Ramus	Narrow	Wide

(table continues on next page)

Table III (continued)

Biblical Differentiation	Direct Descendants of Adam (No Nephilim Ancestry)	Nephilim & Nephilim Ancestry
Defining Characteristics: Post-Cranial		
Skeleton	Gracile	Robust
Femur	With pilaster, not bowed	Bowed without pilaster
Scapula Axillary Margin	Mostly unisulcate with groove on ventral surface. Sometimes bisulcate.	Unisulcate with groove on dorsal surface
Length of Distal & Proximal Phalanges on Pollex	Distal phalanx 2/3 of proximal phalanx	Both of similar length
Rounded robust apical tufts on distal phalanges	No	Yes
Angle between femoral neck and shaft	High	Low
Length of lower arm and leg compared to overall length of arm and leg	Longer	Shorter
Cortical bone of femur and tibia	Thin	Thick

Figure 2. Just before the Flood human populations comprised direct non-Nephilim descendants of Adam, Nephilim populations, and hybrid populations with morphological features of both aforementioned groups. Some skeletal specimens suggest intermixing of traits despite the presence of a variety of identifiable human populations including *Homo sapiens* (Middle East, Africa, Europe, and Asia), *H. neanderthalensis* (mostly Europe), *H. heidelbergensis* (primarily in Africa), *H. erectus* (generally in East Asia), and *H. floresiensis* (Indonesia). Exhibited here are (2.1) *H. sapiens*, Cioclovina Calvaria, 30 kya, Cioclovina, Romania—similar to anatomically modern humans, the specimen exhibits a pronounced supraorbital torus (a) characteristic of Nephilim populations; (2.2) *H. floresiensis*, LB I, Liang Bua Cave, 18 kya, Liang Bua Cave, Flores, Indonesia—although the specimen does not have a supraorbital torus similar to modern humans, it still exhibts (a) midfacial prognathism, (b) no chin, and (c) a sharply receding forehead characteristic of Nephilim traits; (2.3) *H. sapiens*, Qafzeh 9, ca. 100 kya, Qafzeh, Israel—although most of the specimen's characteristics, such as (a) rounded occipital, (b) bulging parietals, (c) chin, and (d) no retromolar space, are similar to modern humans, its thick cranium and facial morphology, (i) supraorbital torus, (ii) midfacial prognathism, and (iii) receding frontal, suggests a derivation from Nephilim populations; (2.4) *H. neanderthalensis*, La Chapelle-aux-Saints 1, 60 kya, La Chapelle-aux-Saints, France—classic Nephilim traits include (a) midfacial prognathism; (b) pronounced supraorbital torus across the forehead; (c) sharply receding frontal, and (d) the absence of a mentum or chin. I suggest this period represents the aftermath of a third floruit of the Nephilim activity, which in some contexts has alleged dates between 130 and 95 kya. This period is described in Genesis 6:4: "and also afterward."

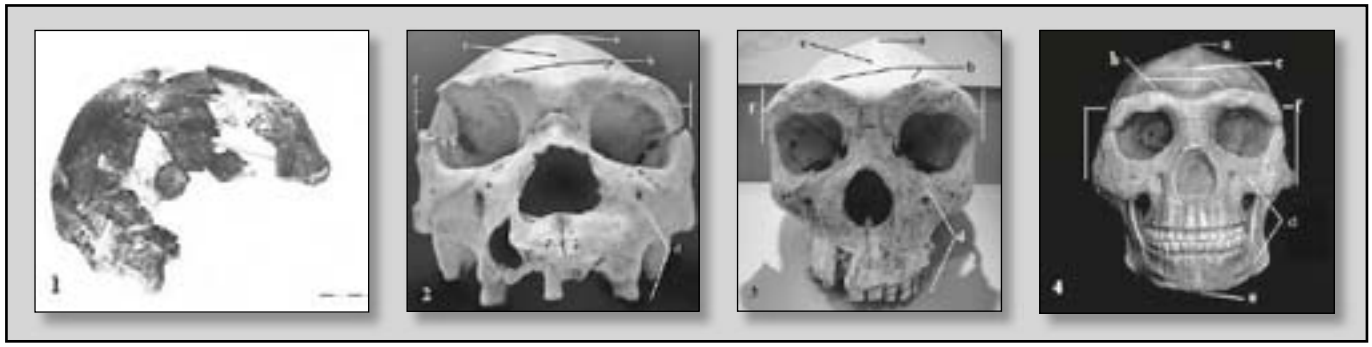

Figure 3. Midway between the advent of the Nephilim and the Flood, Nephilim and non-Nephilim populations coexisted: (3.1) *H. sapiens*, Omo I Cranium, 200 kya, Omo River, Ethiopia—this specimen is classified (even by evolutionists) as anatomically modern *H. sapiens* and resembles us in most ways except that the robust cranium and somewhat pronounced supraorbital torus suggests Nephilim ancestry; (3.2) *H. heidelbergensis*, Miguelón Skull 5, 400 kya, Atapuerca, Spain; (3.3) *H. rhodesiensis*, Lake Ndutu, 400 kya, Lake Ndutu, Tanzania; (3.4) *H. erectus*, Zhoukoudian 1, 550 kya, Zhoukoudian, China. The three non-modern specimens comprise a suite of Nephilim characteristics including (a) sagittal keel; (b) pronounced supraorbital torus extending the length of the frontal; (c) receding frontal; (d) pronounced midfacial prognathism; (e) the absence of a chin; and (f) zygomatic arches that are wider than the brain case. Features not shown include a pronounced occipital bun or torus. I suggest this period of non-modern human diversification correlates with the second emergence of Nephilim activity, beginning in contexts with alleged dates between 800 to 600 kya, in the period described in Genesis 6:4 as "and also afterward."

implies that non-modern human groups are within the morphological range of modern humans. He fails to note that the *range* of characteristics of modern humans is different from non-modern populations – and this difference clearly shows the presence of at least two groups: *Homo sapiens sapiens* or "modern" and non-modern human populations.

Fourth, Lubenow (2004, pp. 121–122; 258–269) claims that human skeletal remains from Australia exhibit *H. erectus* traits and indicate that these populations survived into the Holocene (9500 BP or after) and are therefore post-Flood. Using this assertion, he suggests these human skeletons represent modern human populations, and then argues the traits exhibited by these skeletons indicates that all non-modern humans are modern humans despite their morphological differences:

> "It is simply unthinkable that any *Homo erectus* fossils could still be around so recently. Thus, any thinking person would know that these [Australian] fossils are *Homo sapiens*, no matter what they look like (Lubenow 2004, p. 122)."

Lubenow cites individual specimens, skeletons, and the alleged dates from Kow Swamp (9.5 kya), Cohuna (9.5 kya), Coobool Creek/Crossing (9.5 kya), Lake Nitchie (7 kya), Mossgiel (6 kya), and the 6.5 kya cranium from Cossack (Thorne, 1971; Thorne and Macumber, 1972; Thorne and Wolpoff, 1981; Correspondent, 1972; Oakley et al., 1975; Macintosh et al., 1970; Macintosh, 1971; Freedman, 1985; Stringer, 1988; Habgood 1985; Delson, 1985; Laitman, 1988; Thorne and Laitman 2000; and Freedman and Lofgren, 1979a, 1979b).

Lubenow's arguments are suspect. The provenience of the Cossack remains is entirely questionable. These remains were found on the ground surface, near the base of a sand dune, on the Western coast of Australia, and most likely originated from an earlier context. Freedman and Lofgren (1979a, p. 298) state, "The direct dating of this individual is not feasible at present." Instead, they attempt to date the dunes based on the argument "that rising post Pleistocene sea levels first reached the contemporary coastline around 6,500 BP." However, the dunes could have been caused by pre-Pleistocene storms or floods or, if a creationist explanation is considered, the great Flood of Noah. Furthermore, the bones were not found in the dune but on the surface; hence, dating the remains via the dunes is difficult.

With regard to the Kow Swamp and Cohuna skeletons, these specimens were initially attributed to dates that ranged from 10,320 BP to 7,660 BP based on radiocarbon dates from charcoal and bone collected from lake and air deposited contexts as much as 2 kilometers away from the site (e.g., Thorne and Macumber, 1972, p. 317). Furthermore, the shallowness of the silt deposits allowed only one sample from the site (ANU-533) to be radiocarbon dated to 9260 +/- 270 BP. Both researchers were wary of "sampling problems arising from

Figure 4. As Adam and his descendants "began to multiply on the face of the earth" (Gen. 6:1), Nephilim populations first emerged. This initial floruit of the Nephilim correlates with some contexts allegedly dating between 2 and 1.6 mya and features skeletons attributable to non-modern and modern humans. Specimens of note include (4.1) *H. sapiens*, from Olduvai, Bed II, Kenya, dated to 1.15 mya, Olduvai Gorge Kenya. Reck (1933, Plate 31) exhibits a *H. sapiens sapiens* skeleton he excavated in Bed II before others convinced him of the inappropriateness of his conclusions in light of the evolutionary theory. The cranium is classic *H. sapiens* with a (a) rounded occipital; (b) flaring parietals; (c) a vertical frontal; (d) no supraorbital ridge; (e) no midfacial prognathism; (f) well-defined chin; (g) no retromolar space and with a gracile cranial and facial morphology—this skeleton has no features that would suggest Nephilim derivation; (4.2) *H. erectus*, Sangiran 17, 1–1.6 mya, Sangiran, Java (Indonesia); (4.3) *Homo ergaster*, KNM-WT 15000, 1.6 mya, Nariokotome, West Turkana, Kenya; (4.4) Homo ergaster, KNM-ER 3733, 1.8 mya, Koobi Fora, Kenya; (4.5) *Homo georgicus*, D2700, 1.8 mya, Dmanisi, Georgia; (4.6) *Homo rudolfensis*, KNM ER 1470 skull, 1.9 mya, Koobi Fora, Kenya—despite that this specimen possesses a range of Nephilim traits, the vertical angle of the frontal is similar to *H. sapiens*; (4.7) *Homo habilis*, KNM ER 1813, 1.9 mya, Koobi Fora, Kenya. All Nephilim specimens (2 through 7) show traits common to many non-modern humans: (a) sagittal keel, (b) pronounced supraorbital torus; (c) receding frontal; (d) pronounced midfacial prognathism; (e) zygomatic arches that are wider that the brain case; (f) the absence of a chin; and a thick cranial and facial morphology. Specimens retrieved in these early contexts, which might be attributed to *H. sapiens*, includes Reck's discovery, osteological remains discussed at the beginning of this manuscript, and other remains, which are discussed in Lubenow (2004) and Cremo and Thompson (1998), which should be reanalyzed in light of the import of these discoveries. Furthermore, it is imperative that creationists begin osteological comparisons on all remains attributed to *H. habilis*, *H. rudolfensis*, and *H. ergaster*, as I suspect that some of these remains are from *H. sapiens sapiens*.

possible contamination by bush fires" and "rootlet contamination," which would give the remains a falsely younger date (Thorne and Macumber, 1972, p. 317). A series of more recent carbon dates indicate that the Kow Swamp skeletons date as early as 14.5 kya, the Cohuna cranium around 14.5 kya, and the Coobool Creek/Crossing specimens at 12 kya. Also, there is evidence that the Kow Swamp and Cohuna remains were reburied, which suggests an even earlier period for these skeletons (Thorne and Laitman 2000; Greenfield, 2007; Thorne and Wolpoff, 1981).

Before Lubenow (2004) published the second edition of his book, Stone and Cupper (2003) acquired optically stimulated luminescence (OSL) dates and completed a thorough paleoenvironmental analysis of the sediments around Kow Swamp. Their research indicated that these populations lived, died, and were interred between 26 and 19 kya. The shoreline silt, where Kow Swamp skeletons were retrieved, and by extension Mossgiel and Lake Nitchie contexts, are dated between 26 and 19 kya. The authors state that few "robust humans" from Kow Swamp survived and were interred in the sand lunette, which formed around 19 kya (Stone and Cupper, 2003, p. 99). In addition, there is evidence, using a large comparative sample of 588 craniums, that Australian skulls such as those found at Kow Swamp, Coobol, and Nacurrie were subjected to apparatus-derived cranial deformation, such as wrappings. These deformation processes may result in flatter frontals and occipitals, more angulated parietals, and sagittal keels when compared to skulls that were not purposefully deformed (Anton and Weinstein, 1999; Weinstein and Anton, 1997). This deformation could have continued to modern times, as several Tasmanian skulls could have been purposefully shaped causing a boxlike cranium (see Figure 5).

To support his arguments, Lubenow (2004) published only the most recent dates for the aforementioned Australian assemblage and ignored studies that confirm (1) earlier date ranges for these specimens, (2) their association with paleoanthropological contexts before the Holocene, and (3) their similarity to other non-modern human populations such as *H. erectus*.

Lubenow uses alleged and questionable exceptions to prove the rule. By employing an incorrect description of a trait on a Tasmanian cranium or publishing only the data that supports his views concerning "post-Pleistocene" *H. erectus* skeletons in Australia, he attempts to support his claims that non-modern human populations are (1) within the morphological range of modern humans or (2) are modern humans despite their morphological differences. If Lubenow's assertions are correct, surely he could find an ample number of living or recently buried individuals or populations from North America, Africa, Australia, or anywhere, to evidence that the *range* of *H. erectus* or Neanderthal traits are found in the skeletons of modern humans. Such samples have not been found; therefore, Lubenow's analysis and conclusions appear untenable.

Fifth, Lubenow (2004) attempts to support a notion that Neanderthals, *H. erectus*, and other non-modern humans are actually modern humans with bad cases of rickets, syphilis, or both.

> "There is a sizable body of scientific data that suggests one or more of the above-mentioned factors [i.e., rickets, syphilis, poor nutrition] would constitute a reasonable and nonevolutionary explanation for the Neandertal morphology (Lubenow, 2004, p. 85)."

Ivanhoe (1970), who cites Rudolf Virchow, hypothesized that several Neanderthal skeletons displayed possible osteological evidence for rickets. Wright (1971) argued that there were several features on Neanderthal skeletons suggesting congenital syphilis and noted that rickets and syphilis frequently occur together in societies with poor nutrition.

Ivanhoe argues that Neanderthal populations suffered from a lack of vitamin or hormone D caused by (1) poor sunlight in European locales from the end of the Wurm glaciation (70 kya) to the middle of the Paudorf interstadial (35 kya) and (2) a poor diet that comprised only hunted game. Major problems with Ivanhoe's hypothesis include that Neanderthals are found in contexts with alleged dates before 70 kya and up to 24 kya. Furthermore, from Gorham's Cave, Gibraltar, the quantity of fish

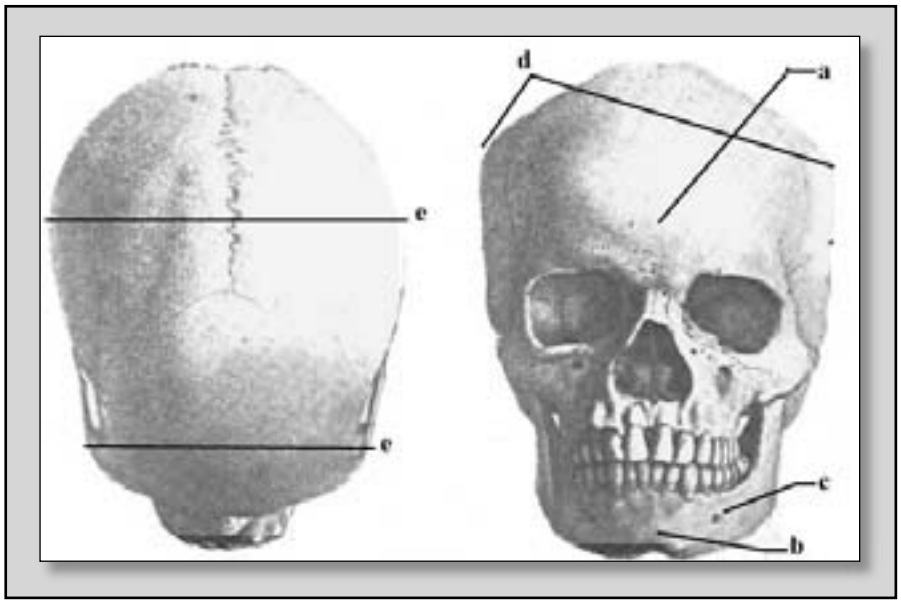

Figure 5. Tasmanian cranium, dorsal and anterior views, showing anatomically modern human features: (a) vertically angled forehead, (b) chin, (c) mental foramen, (d) flaring parietals, and (e) brain case that is wider than the zygomatic arch. Not shown is the rounded occipital and gracile mandible, both anatomically modern human traits (from Roth, 1899, p. 194).

bones suggests Neanderthals fished. Fish oil is an extremely rich source of Vitamin D. Still, Neanderthal traits at this locale are readily evident despite their presumably Vitamin D rich diet. Also, populations of *Neanderthal*, *H. erectus*, *H. heidelbergensis*, *H. ergaster*, and other non-modern human skeletons are also found in southern latitudes such as the Middle East, Indonesia, southern China, and Africa, which received much sunlight. However, traits such as supraorbital torus, midfacial prognathism, sharply receding foreheads, and no chins, which are characteristic of non-modern humans, abound in these populations. Virchow stated that he observed the bowing of tibiae in Neanderthal bones. However, there is no evidence of this (Wright, 1971). Also, bowing of the radius and femur is most likely related to significant muscularity of non-modern human populations (Klein, 1999). In addition, if rickets were present, there should be evidence for osteomalacia in female pelvii, making parturition difficult. No evidence for this pathology exists in Neanderthal skeletons (Wright, 1971).

With regard to a syphilitic causation for Neanderthal traits, there are major problems with Wright's argument. A syphilitic Olympian brow or bossing in modern humans is evidenced by an expanded vertical forehead or frontal bones hanging over deep-set eyes. These features do not emulate the prominent supraorbital torus with a receding frontal found in non-modern humans such as *H. erectus*. Also, Wright mentions the thinning of occipital and parietal bones of Neanderthal skeletons at Staroselje and Pech de l'Aze (Wright, 1971). However, having reviewed these remains, there is sparse evidence for thinning in these specimens, especially compared to cranial measurements for modern humans.

Rickets and syphilis are degenerative diseases that attrite osteological growth and eventually cripple their hosts. However, Neanderthal skeletons in the studies by Ivanhoe and Wright do not resemble crippled modern humans but powerful non-modern humans, possessing robust cranial and post-cranial skeletons. Furthermore, their skeletons are found with the remains of Pleistocene megafauna and lithic assemblages, evidencing that *H. neanderthalensis* hunted their dangerous prey with short spears and hand axes. The studies by Ivanhoe and Wright do not support Lubenow's suggestion that all populations of *H. erectus*, *H. neanderthalensis*, and other non-modern humans populations are syphilitic, ricket-laden *Homo sapiens sapiens*. Furthermore, modern humans with rickets, syphilis, or both, do not possess great strength, display robust cranial and post-cranial morphology, or exhibit the range of traits exhibited by Neanderthals or other non-modern human populations. Therefore, Lubenow's conjecture that non-modern humans are modern humans with rickets or syphilis appears unsustainable.

Sixth, Jack Cuozzo (1998) hypothesized that non-modern human populations, such as Neanderthals, are *Homo sapiens sapiens* who, according to Genesis, are more than several hundred years old and existed before and soon after the Flood. Cuozzo appears mistaken because many skeletons of non-modern humans portray a youthful injury and demise as shown by their dentition and epiphyseal ends, which are unfused or fusing. Despite their lack of maturity, these skeletons still show the range of traits exhibited by mature *H. ergaster*, *H. erectus*, *H. neanderthalensis*, and other non-modern human populations. An example of the non-modern features in skeletons that died at an early age is the remains associated with KNM-WT 15000, which has been attributed to *H. ergaster or H. erectus*. Here, an erupting second molar and unfused epiphyseal plates, such as the caput of the proximal femur, indicate a juvenile skeleton of between 10 and 12 years of age (Brown et al., 1985). Still, the morphological features are characteristic of non-modern humans: prominent supraorbital torus or browridge, no chin, receding forehead, and midfacial prognathism (see Figure 4.3 for lateral-anterior view of the cranium). Also, neonate (baby or toddler) skeletons, such as those found at Devil's Tower, Pech de l'Aze, Starosel'e, Engis, La Quina, Subalyuk, Teshik-Tash, Gorham's Cave, and Shanidar exhibit the same features, such as a robust jaw and midfacial prognathism, as their non-modern juvenile and fully adult counterparts and differ from the morphology of modern human neonates, juveniles, and adults (e.g., Stringer et al., 1990, p. 148; Ivanhoe, 1970, p. 578). To reiterate, if skeletons of young non-modern humans have the range of traits possessed by adult non-modern humans, these traits cannot be caused by great age. Therefore, Cuozzo's hypothesis that great age is a causal factor for non-modern human traits appears flawed.

Finally, Custance (1975) suggested that *H. erectus* and Neanderthal features are a result of mastication of uncooked or partially cooked foods. These mechanisms he argued would cause the development of a supraorbital torus or browridge, a receding forehead, and outward extension of the zygomatic arches (Custance, 1975; Smith, 1983). Custance stated that these changes occurred during childhood and remained permanent because of a calcium-poor diet. The aforementioned baby and toddler remains with non-modern cranial traits, such as midfacial prognathism and robust mandibles (compared to *H. sapiens* neonates), make it untenable that these features were caused by chewing uncooked meat (Stringer et al., 1990; Trinkaus, 1986). Furthermore, non-modern human populations most likely had a calcium-rich diet as evidenced by their gnawing marks on bones and longitudinal splitting of bones to access marrow, both rich sources of calcium. Since non-modern human

traits appear in such young skeletons and at least some of these populations possessed a calcium rich diet, it is unfeasible that the latter populations are merely modern humans that consumed much uncooked food.

To sum, the corpus of human skeletons in the paleoanthropological contexts show clear differences between *Homo sapiens sapiens* and other non-modern human populations and that these disparities were caused by "genetic reasons" (Klein, 1999, p. 393). These differences conform to the model proposed in Genesis, which states that although non-Nephilim and Nephilim populations derived from Adam, there were differences, especially with respect to inherited ancestry, appearance, physical ability, and culture.

Comparison: Nephilim in Genesis 6 and the Skeletons, Culture, and Alleged Dates of Non-modern Humans

This Genesis model should be evaluated as to the extent non-modern human populations, their culture, and behavior, reflect the description of the Nephilim in Genesis 6. Below is a comparison of paleoanthropological data to each statement made concerning the Nephilim in Genesis 6.

"In those days, and also afterward" or *ba'yamim ha'hem vegam acharey-can* [בימים ההם וגם אחרי־כן] (Genesis 6:4)

The above statement indicates that there were at least two periods before the Flood that the Nephilim flourished. The first period (Genesis 6:1) occurred "when men began to multiply on the face of the earth"; the later period (or periods) occurred after this or "also afterward" (Genesis 6:4). That there were at least two flourishings of Nephilim culture correlates with the paleoanthropological record with regard to non-modern human skeletons. The first evidence of definitive non-modern human skeletons are attributed to *H. habilis*, *H. rudolfensis*, *H. ergaster*, or *H. erectus* and are in contexts with alleged radiometric dates around 2 to 1.8 mya. These comprise Olduvai Hominid (hereinafter OH) 24, 52, and 60; KNM-ER 1802, 2598, and 3228; Swartkrans SK-68; and KNM-WT 15001 from East and South Africa; the Modjokerto cranium from Java; and the Dragon Hill Cave mandible from Sechuan Province in China (Day, 1986, pp. 177–178; Walter et al., 1991, pp. 145–149; Feibel, Brown, and McDougall, 1989, pp. 611–612; Johanson and Taieb, 1976, p. 297; Susman, 1989, p. 451; Gingerich and Smith, 1987, pp. 203–204; Lubenow, 2004, pp. 351, 353; Klein, 1999, pp. 217–228; Ciochon et al., 1996; Anton, 1997; Rightmire, 1979; Brown et al., 1985).

Klein (1999, pp. 217–219) cites specimens KNM-ER 1501, 1502, 1813, 1805; OH 7, 13, 16, 24, 62, and Swartkrans (SWT) 53 and attributes them to *H. habilis* narrowly understood and assigns KNM-ER 1470, 1590, 3732, 1801, 1802; teeth from Shungura Members E-G, South Ethiopia; the temporal bone KNM-BC 1 from Chemeron Formation in Central Kenya; and the mandible UR 501 from Chiwondo Beds at Uraha, Malawi, to *H. rudolfensis*. However, besides KNM-ER 1470 and OH 24, which I believe derive from non-modern human or australopithecine populations, respectively, comparative analyses are needed before creationists hastily attribute the aforementioned remains to modern human populations. Here, I agree with Lubenow (2004) and Mehlert (1994) that many of these remains might derive from australopithecines, created kinds resembling apes with perhaps more bipedal capabilities. (A discussion of australopithecines is outside the scope of this manuscript.)

The second floruit is associated with the emergence of non-modern humans, with alleged date ranges from 800 to 600 kya, comprising skeletons associated with *H. antecessor* and *H. heidelbergensis*. These specimens include the *H. heidelbergensis* craniums found at Bodo, Ethiopia (600 kya) and the *H. antecessor* remains found at Gran Dolina, Atapuerca, Spain (800 kya).

The third resurgence of non-modern human skeletons, I argue, is associated with strata allegedly dating from 130 to 95 kya and comprises the spread of classic Neanderthal populations throughout Europe, *H. erectus* throughout Asia, and the emergence of *H. floresiensis* allegedly around 95 kya in Indonesia.

The paleoanthropological evidence suggests at least three temporal periods associated with the distribution of non-modern humans throughout the earth, before the Holocene period, which correlates with the description of the Nephilim in Genesis 6. Here, Genesis notes that Nephilim populations emerged initially as the descendants of Adam "began to multiply on the face of the earth" (Genesis 6:1) and "also afterward" (Genesis 6:4).

"The heroes" or *hagiborim* [הגברים] (Genesis 6:4)

As noted previously, the word "heroes" has several connotations: success in combat or hunting and extreme bravery. Hence, *giborim* implies both physical prowess and the accomplishment of acts of valor by an individual or group.

With regard to physical strength, non-modern humans were clearly stronger than modern humans, as evidenced by their thicker bones, larger muscle attachment locales on their skeleton, bowing of long bones such as the radius and femur, morphology of their hands, which suggests a powerful grasp, dorsally located sulcus on their scapula, reflecting the extraordinary power of the muscles in their upper arms, and the low angle between their femoral neck and shaft, indicating severe loading and intense physical

activity (Dunsworth, 2007; Klein, 1999; Trinkaus, 1983, 1989, 1993). As more is known about Neanderthals due to their burial practices, these populations exhibit a massiveness of their trunk and limb bones indicating a "strength seldom attained by modern humans" (Trinkaus, 1978, p. 58). Geist (1981, p. 30) notes that Neanderthals were "far more powerful than modern humans" as evidenced by the wear patterns on Neanderthal tools, which cannot be duplicated and reflects "a supremely powerful musculature."

There is also evidence that non-modern humans reached maturity faster than modern humans. In an analysis of 360 incisors and canines from 119 humans spanning an alleged time period of 800 kya, Rozzi and Bermudez de Castro (2004) noted that perikymata or disturbances in the deposition of crown enamel showed wide spacing and hence, faster growth in Neanderthals, *H. heidelbergensis* and *H. antecessor* compared to modern humans. Modern humans exhibited teeth with closely spaced perikymata evidencing slower growth. Neanderthals, which exhibited the most rapid growth, formed crown enamel 15% faster than modern humans, indicating that they reached maturity while modern humans were still in their adolescence (Rozzi and Bermudez de Castro, 2004, p. 939). In addition, Neanderthals and other non-modern humans acquired their second and third molars at earlier age than modern humans (Tompkins, 1996). Tooth eruption and wear, epiphyseal fusion, and osteon ageing suggests that Neanderthals did not survive beyond their mid-forties (Trinkaus, 1986, 1995; Trinkaus and Thompson, 1987).

That non-modern human populations subjected themselves to hazardous lifestyles is evidenced by several lines of data. At Sima de los Huesos (Site SH) at Atapuerca, Spain, with an alleged date around 300 kya, an assemblage of greater than 2000 bones mostly attributed to *H. antecessor*, with a minimum number of 32 individuals, exhibited no mandibles or teeth from individuals older than 35 years of age, a juvenile with a severely fractured browridge, and a young adult with a large facial abscess (Bermudez de Castro, 1996; Bermudez de Castro and Nicolas, 1997; Perez et al., 1997). From a sample of 669 teeth from a minimum number of 165 Neanderthals, arrested enamel growth exhibited by pitting and grooving appeared on 36% of the specimens or 57% of the population (Ogilvie et al., 1989). The frequency of these hypoplastic defects is rare in modern humans in the Upper Paleolithic, indicating that non-modern humans were impacted by trauma, pathologies, or food shortages (Brennan, 1991; Neiburger et al., 1990). Neanderthals exhibit healed and mortal fractures, stab wounds, club impacts as evidenced by skeletons at La Chapelle-aux-Saints, Kebara, Tabun, Shanidar, La Ferrassie, Feldhofer, Krapina, and Sala; at a degree far greater than contemporary modern human populations (Berger and Trinkaus, 1995; Dawson and Trinkaus, 1997; Trinkaus, 1978, 1983, 1989, 1995).

In summary, non-modern human populations were much stronger, developed faster, and engaged in traumatic lifestyles compared to modern human groups. This evidence correlates with a description of the Nephilim as heroes in Genesis 6, a phrase that indicates physical prowess in the pursuit of high-risk accomplishments.

"The men of name (renown)" or *anashay ha'shem* [אנשי השם] (Genesis 6:4)

This is a phrase that is commonly and correctly translated as "the men of name," renown, or roughly "famous." The author of Genesis makes it clear that the Nephilim had tremendous reputations in the ancient world. That the Nephilim were both heroes and men of renown clearly indicates that these populations had tremendous physical prowess, which, when tested, resulted in success and the aggrandizement of their personal reputations.

If the cultural debris does not derive from early modern humans, there is evidence that *H. habilis* pursued subterranean plant remains and built structures. Bone artifacts from Swartkrans, Sterkfontein, and 26 of the 41 bone flakes from Olduvai Beds I and II, allegedly dated between 2 to 1.6 mya, exhibited polish from digging through soil (Brain and Shipman, 1993; Brain, 1985; Shipman, 1984). At site DK from Olduvai Bed I, with a proposed date around 1.75 mya, a 4- to 5-meter cluster of natural lava blocks indicate the base or at least the dimensions of a structure (Leakey, 1971).

Populations attributed to *H. erectus* formed figurines, interred their members in burials or cremated them, built structures, and traveled lengthy distances by sea. A carved human figurine, dated to 400 kya, was found near Tan-Tan, Morocco, and is associated with contemporaneous *H. erectus* fossils. The figurine was crafted and most likely painted (Svitil, 2003). Shelters mostly likely formed by *H. erectus* were excavated in Japan with alleged dates around 500 kya (Hadfield, 2000). Remains of *H. erectus* on Flores Island in Indonesia indicates their employment of seaworthy craft able to travel distances around 19 km (Klein, 1999).

Neanderthals fished, built structures and hearths, made jewelry, engraved objects, formed musical instruments, and gathered diverse foodstuffs as evidenced from the following contexts and alleged dates: Trout and pike remains dated to 75 kya at Grotte XVI in southern France (Wong, 2000); walls in Arago Cave, France, dated to 400 kya (Hayden, 1993); ivory rings, pierced animal teeth, and hearths surrounded by blocks from Arcy-sur-Cure, France, at 34 kya (Hall, 2008; Hublin et al., 1998); circular foundations of bone and stone and engravings on a elephant tibia from Bilzingsleben,

Germany, at 412 kya (Gore, 1997); large limestone blocks at Pech de l'Aze Cave, France, at 45 kya (Hayden, 1993); flint facemask at La Roche-Cotard, France, at 32 kya (Palmer, 2003); bear bone flute at Divje Babe Cave I, Slovenia, at 43 kya (Wong, 1997a, 1997b); and the assemblage of pine nuts, the remains of rabbit, tortoise, dolphin, and seal, and mussels at Gorham's Cave, Gibraltar, from 125 to 28 kya (Hall, 2008).

More compelling is the wide range of lithic and bone tools that Neanderthals manufactured: Upper Paleolithic tools were found at Krapina, Croatia, in contexts around 130 kya (Simek and Smith, 1997); bone bifaces at Castel di Guido, Italy, dated to 450 kya (Mallegni and Radmilli, 1988); Chatelperronian tools at La Ferrassie rock shelter, France, at 33 kya (Niewoehner et al., 2003); Upper Paleolithic tools at Qafzeh, Israel, at 98 kya (Hayden, 1993); bone pick and awl at Regourdou Cave, France, at 70 kya (Hayden, 1993); Chatelperronian lithic assemblage at Saint-Cesaire Rock Shelter, France, at 36 kya (Klein, 1999); and bone tools and microlithic stone implements at Malagrotta, Italy, at 450 kya (Mallegni and Radmilli, 1988; Klein, 1999).

Despite that non-modern humans, such as *H. habilis*, *H. erectus*, and Neanderthals, *could* fish, gather vegetation, hunt small game, retrieve shellfish, erect structures, and manufacture bone and Upper Paleolithic, Chatelperronian, and microlithic projectile points, which permitted them to kill prey from a distance, most of their cultural assemblages exhibits a *preference* for an alternate cultural norm. Non-modern human sites are overwhelmingly associated with megafauna and associated with Early Stone Age or Middle Stone Age artifact assemblages comprising choppers, hand axes, and other bifacial tools. These were either put on short spears, hand held, or perhaps thrown and required the killing of the large animals from short distances or by hand (O'Brien, 1984). In addition, non-modern human populations mostly comprised small teams of specialized hunters (Trinkaus, 1978, 1983, 1989, 1995).

FLK Zinj in Tanzania, with an artifactual assemblage associated with *H. habilis*, comprises bones of large mammals including elephant, hippopotamus, wild boar, water buffalo, and hyenas (Bunn and Kroll, 1986). Nearly every site with the remains of non-modern humans comprises the bones of megafauna, large herbivorous and carnivorous animals. A sample of associations between non-modern humans and the remains of megafauna includes Arago Cave, France, with elephant, wild boar, and wild horse (Day, 1986 p. 49); Biache-Saint Vaast, France, with rhinoceros, wild ox, and giant deer (Gore, 1996); Karain, Turkey, with hippopotamus and cave bear (Otte et al., 1998); La Quina Rock Shelter, France, with giant bison, cave bear, and elephant (Jelinek and Debenath, 1998); Qafzeh, Israel, with rhinoceros and wild horse (Day, 1986, p. 121); Saint Brelade Cave, England, with woolly mammoth; and Torralba, Spain, with lion, elephants, and long-horned wild ox (Arsuaga, 2002). With regard to Neanderthals, Geist (1981, p. 30) states their hunts were "slanted heavily to large bodied grazers and carnivores and almost devoid of small game," which "are beyond comparison with any modern hunting culture."

To sum, non-modern humans possessed a range of food gathering and lifestyle stratagems but preferred a culture that was focused on high-risk hunting for megafauna, with short-range or direct-contact lithic projectiles. These preferences were unlike modern human cultures, which preferred gathering, sendentism, and lithic tools that were fashioned to kill from greater distances. The personal and cultural preference of non-modern humans, despite that they had the ability and knowledge of food procurement, building technologies, and lithic manufacturing strategies of modern human populations, correlates with the Biblical description of the Nephilim. Here, the latter are described as heroes and people of renown, a statement that correlates with the high risk and valorous actions of non-modern human populations as reflected by their cultural assemblages.

"Only evil all the day" or *rak rah col-ha'yom* [רק רע כל־היום] (Genesis 6:5)

The phrase suggests that all men with and without Nephilim ancestry were evil. However, that this mention of evil immediately follows the description of the Nephilim as heroes and men of name, suggests Nephilim populations were ultimately associated with evil thoughts and deeds.

Aforementioned data bears repeating: Non-modern human populations are associated with higher mortality at younger ages, before their mid-forties (Trinkaus, 1986, 1995; Trinkaus and Thompson, 1987). That this early mortality is associated with signs of trauma—healed and mortal fractures, stab wounds, and club impacts, as evidenced by skeletons at La Chapelle-aux-Saints, Kebara, Tabun, Shanidar, La Ferrassie, Feldhofer, Krapina, and Sala—at a proportion much greater than found in skeletons of contemporary modern human populations, evidences a combative and violent lifestyle that cannot solely be attributed to the dangers of the hunt (Bermudez de Castro, 1996; Bermudez de Castro and Nicolas, 1997; Perez et al., 1997; Berger and Trinkaus, 1995; Dawson and Trinkaus, 1997; Trinkaus, 1978, 1983, 1989, 1995).

While cannibalism is rare among modern humans before the Holocene, these detestable practices are regularly evidenced in non-modern human assemblages where human bones exhibit cut marks, gnawing, burning, longitudinal fragmentation, or a combination thereof. Among non-modern human

populations, the evidence for the consumption of human flesh is wide ranging, both geographically and temporally. Researchers have claimed evidence for cannibalism at Neanderthal sites, in contexts allegedly dated from 28–800 kya, at Vindija Cave and Krapina in Croatia; Combe-Grenal, Abri Moula, and Hortus Cave, and Mouala-Guercy in France; Engis Caverns in Belgium; Ehringsdorf in Germany; Gran Dolina in Spain; at the *H. antecessor* assemblage at Atapuerca, Spain; at *H. heidelbergensis* sites of Klasies River Mouth in South Africa (105 kya), Bodo, Ethiopia (600 kya), and Arago, France (400–250 kya); and at Ngandong (Solo) in Java (200–50 kya), as evidenced by the removal of the bases of *H. erectus* craniums (Holden, 1999; Wolpoff, 1980; Cook, 1991; Deacon and Shuurman, 1992; Defleur et al., 1993, 1999; Carbonell et al., 1995; Le Mort, 1989; de Lumley, 1972, 1975; White, 1987; and Lubenow, 2004, pp. 338–353 [C denotes suggested evidence for cannibalism]). Conversely, evidence for cannibalism in modern humans is sparse before and after the Holocene (Arens, 1979). Only, Lubenow (2004, p. 338) notes evidence for cannibalism among modern humans at Maszycka Cave, Poland (40 kya).

The earliest art from non-modern human populations appears to be the female figurines attributed to *H. erectus*, which were found near Tan-Tan, Morocco, and Berekhat Ram, Israel, with alleged dates around 400 kya and between 300–500 kya, respectively (Figure 6; Svitil, 2003; Goren-Inbar, 1986; Goren-Inbar and Peltz, 1995). Both figurines are naked portraits of the human anatomy, with the Berekhat Ram figurine portraying the sexually distended portions of the female anatomy.

The figurines from presumably non-modern human groups should be considered with the study by Wright (1971) for syphilis in Neanderthal skeletons. Although not a cause for non-modern traits, as suggested by Lubenow (2004), the study points to possible osteological traits associated with syphilis: The pitting of occipital and parietal areas, lack of incisors and flattened taurodont molars similar to Moon's mulberry molars, and "saddle nose," or the relative depression of the bridge of the nose (Wright, 1971, p. 409). Furthermore, it is noteworthy that besides the sexually themed figurines, non-modern human art is limited to geometrical lines on bone. There are no extant figurines or imagery of animals, scenery, plants, on any art outside these naked anthropomorphic carved figures. Conversely, cave art associated with modern human remains exhibits an array of imagery including plants, animals, and handprints. In a future manuscript, the author provides data suggesting that many caves were formed before the Deluge and that the paint, with plant oils that served as durable binding agents, could have survived the destruction wrought by the Flood.

Figure 6. Earliest figurines associated with *H. erectus*: From Berekhat Ram, Israel (left) and Tan-Tan, Morocco (from Svitil, 2003; Goren-Inbar, 1986; Goren-Inbar and Peltz, 1995).

To sum, non-modern human populations are associated with skeletons and cultural assemblages that exhibit physical trauma, violence, cannibalism, an artistic fixation on sexually-themed figurines, and evidence for syphilis greater than that of modern human populations during these same periods. This association between evil acts and non-modern human skeletons and assemblages correlates with the descriptions of Nephilim and their evil thoughts and acts described in Genesis 6. Furthermore, the widespread distribution of non-modern humans before the onset of the Holocene epoch suggests the rapid spread of these populations might have been facilitated by their combativeness, violence, cannibalism, and predilection for promiscuous sexuality.

The paleoanthropological data on non-modern human populations suggests a correlation with the Nephilim of Genesis 6. The Nephilim were men or *anashim* [אנשים] (Genesis 6:4) but different from men by their physical abilities, actions, and the tremendous reputations that resulted from their acts. Hence, the clear characteristics that made the Nephilim different from men were: (1) their appearance, in that they could be differentiated from the non-Nephilim populations from Adam; (2) their physical power and ability; (3) their personas, in that they sought and accomplished actions of tremendous valor; and (4) their association with continuous evil.

Conclusions

Genesis provides the best explanatory model for paleoanthropological data with regard to the origin, variation, and continuation of human populations. That skeletal parts resembling those of modern humans have reportedly been found in the earliest paleoanthropological contexts is explained in that (1) contemporary modern human populations represent the descendents of Noah, (2) Noah was a direct patrilineal descendant of Adam, the first human God created, and (3) later Nephilim populations emerged only after the direct descendants of Adam and Eve "began to multiply on the face of the earth."

The emergence of the Nephilim after the descendants of Adam began to populate the earth accounts for the subsequent variation in the range of human morphological and cultural traits, as exemplified by most skeletons and assemblages attributed to *H. habilis*, *H. rudolfensis*, *H. ergaster*, *H. erectus*, *H. antecessor*, *H. heidelbergensis*, *H. neanderthalensis*, *H. floresiensis*, and other non-modern human populations. The latter attributions represent original Nephilim populations or hybrid groups where Nephilim populations interbred with descendants of Adam, which had, until that time, been minimally affected by Nephilim genetic ancestry.

That Noah and his family, direct descendants of Adam not influenced by Nephilim ancestry, were the only humans that survived the Flood, explains the extirpation of all non-modern human populations throughout earth and the continuation of only modern human populations or *Homo sapiens sapiens* into the present Holocene period.

Postscript

For the past four years, the laboratories of 454 Life Sciences, in Branford, Connecticut, have participated in a joint project with the Max Planck Institute for Evolutionary Anthropology, in Leipzig, Germany, to extract and sequence the full genetic code of a Neanderthal. According to George Church, professor of genetics at Harvard Medical School, the sequence could be used with stem cells to clone "*neo-Neanderthals*" with the goal of forming "*a peer group, which would mean creating several clones, if not a whole colony*" to study them and their problem solving techniques and to "*expand humanity's genetic diversity*." This view is not isolated in the evolutionary community. John Hawks, a paleoanthropologist from the University of Wisconsin states, "*In the end … we are going to have a cloned Neanderthal, I'm just sure of it*" (Zorich, 2010, pp. 38, 41). I believe this research, if successful, would be a hellish mistake. The cloning of Neanderthals, or any non-modern humans, would facilitate the emergence of extremely powerful, intelligent, and evil Nephilim populations not seen since the Noachian Deluge.

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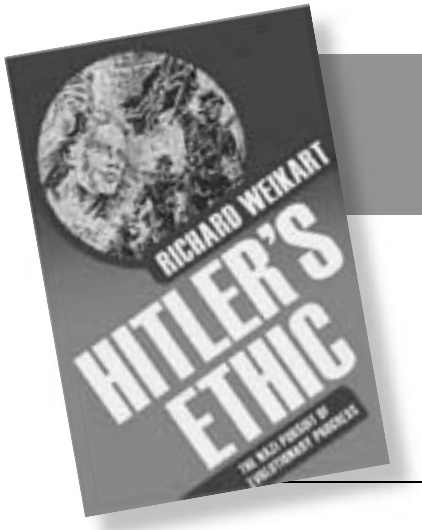

Book Review

Hitler's Ethic: The Nazi Pursuit of Evolutionary Progress

by Richard Weikart

Palgrave Macmillan, New York, NY, 2009, 254 pages, $80.00.

One of the most criticized parts of the movie *Expelled* is the implication that Darwinism and the Holocaust were strongly causally related. Although this connection is well documented in the scholarly literature, most of the documentation is in the German language or in detailed, ponderous, barely readable, scholarly tomes published by academic presses. *Hitler's Ethic* by Richard Weikart, professor of modern European history at California State University, is a carefully and well-referenced, readable book using a large number of primary sources, many in German, which elegantly document the film's claims.

An important contribution of this book is the vast quantity of Hitler quotes that Weikart located from reading the enormous number of extant Nazi documents in German archives, many of which have not been translated into English before Weikart. The documents used include Hitler's speeches and those of his close disciples, both public and private. For example, Weikart quotes Hitler, "I have acted, just as nature does, not brutally, but rather according to reason, in order to preserve the better ones [that is, Aryans], and I have thereby freed up hundreds of thousands of positions" (p. 194).

Hitler promised that these positions were now available for good German children. Eliminating "the 'inferior' Jews to make room for the 'superior' Germans was—in Hitler's view—part of the natural evolutionary process. Hitler then made clear that this principle defined his ethic, stating, 'For here also we recognize only one principle, namely the preservation of our race, preservation of our species. Everything that serves this principle is right. Everything that is detrimental to it is false.' In this speech late in the war Hitler justified killing the Jews by appealing to his evolutionary ethic" (p. 194).

This work follows Weikart's well-received previous book *From Darwin to Hitler* (Weikart, 2004) and further documents his conclusion, namely that Darwinism had a major influence on Hitler and the Nazi movement. Hitler integrated social Darwinism and anti-Semitism, insisting that the Jews are "not primarily a religion, but a race," an inferior race that has polluted the superior Aryan race (p. 75). In Hitler's words, "The racial question gives the key not only to world history, but to all human culture … for us there is no class struggle but rather a racial struggle" (p. 76).

Weikart documents that Hitler's evil can be explained only by evaluating the influence of Darwinian eugenics on German academia and politics, a conclusion that is obvious to any well-informed student of the history of the Nazi movement. Weikart uses scores of primary sources to document exactly how central not only Darwinism, but also science, was to all of the major goals of Nazism. Hitler had the backing of many of the leading scientists, many of whom Weikart names. Furthermore, "Hitler was enthralled with modern science and technology" partly because he considered it "the product of Aryan ingenuity" (p. 79). Weikart notes that many of the leading "German scientists and physicians supported and assisted Hitler in his drive to eliminate the Jews. The world famous geneticist Lenz wrote in the 1936 edition of the major text he coauthored that Jews were a harmful 'race of parasites,' and organisms 'thrive better without parasites.' … In 1943, while the Jews were being massacred, Rüdin praised Nazi policies, including

'the fight against parasitic foreign-blooded races, such as the Jews and Gypsies.' Many German anthropologists cooperated with the Nazi regime, which they believed was implementing their racial agenda. Some physicians even participated directly. At Auschwitz respected colleagues Nazi eugenicists Otmar von Verschuer and Joseph Mengele [who held doctorates in physical anthropology and medicine], determined which Jews would live and which would die. Mengele even sent tissue samples from corpses in Auschwitz to Verschuer" (p. 194).

The common belief that Hitler lacked morals, Weikart concludes, is incorrect—he was deeply ethical, but his ethics were not Judeo-Christian or even classical ethics, but rather evolutionary ethics. Weikart writes that his book demonstrates "the surprising conclusion that Hitler's immorality was not the product of ignoring or rejecting ethics, but rather came from embracing a coherent—albeit pernicious—ethic" (p. 2). Specifically, "Hitler was inspired by evolutionary ethics to pursue the utopian project of improving the human race. He really was committed to deeply rooted convictions about ethics and morality that shaped his policies. Evolutionary ethics underlay or influenced almost every major feature of Nazi policy: eugenics (i.e., measures to improve human heredity, including compulsory sterilization), euthanasia, racism, population expansion, offensive warfare, and racial extermination. The drive to foster evolutionary progress—and to avoid biological degeneration—was fundamental to Hitler's ideology and policies" (p. 2).

Weikart evaluates each of Hitler's major policies, including his territorial expansion policy called *lebensraum*, showing that all of Hitler's major policies ultimately supported his eugenic goals. Elimination of those with hereditary diseases, racial extermination, compulsory sterilization, and German population expansion into non-German territories were all programs designed to reduce biological degeneration and increase the population of those that belonged to what the Nazis judged as the superior race. For this reason, Hitler felt it was proper to exploit "lower human beings" such as by using the forced labor of those who were "considered racially inferior" including Jews, Slavs, and Negroes (p. 76).

The superior race, the Aryans, would for scientific reasons eliminate "lower human beings" (p. 76). As a politician with this radical plan, Hitler had to speak with forked tongue—one side to please his support base among the public and another side to his close intimates to achieve his actual goals. Weikart very effectively sorts out the Nazis' often misleading public statements from the actual goals of Hitler and the leading Nazis, noting that "few historians understand evolutionary ethics, especially in the early twentieth-century racist form embraced by Hitler. Many scholars have noticed Hitler's commitment to social Darwinism, but almost no one has analyzed the ethical dimension of it" (p. 2).

It was this goal that Weikart set out to achieve, and it is a goal he effectively accomplishes. Weikart documents one important aspect of Nazism and Hitler that is often ignored, namely, Hitler's determination to destroy Christianity and how this goal fit into his evolutionary ethic. The major reason for his disdain of Christian ethics was because it opposed the ruthless, survival-of-the-fittest, nature-red-in-tooth-and-claw philosophy of Darwin's natural selection mechanism that Hitler wanted to use to produce his superior race. In contrast, Christianity taught the importance of helping the sick, the weak, the handicapped, the poor, the disenfranchised, and the downtrodden, all goals that Hitler opposed. Furthermore, "Hitler not only jettisoned (and at times expressed contempt for) many tenets of Christian morality, but his policies also showed disdain for … most other forms of ethics prominent in Western culture. Hitler's ethics—and the policies that flowed from it—stands in stark contrast to what most people today consider moral" (p. 2).

Many of the Nazi ideas and goals openly came from Darwinism. For example, the central idea in Nazism—that the individual counts for nothing and the nation for everything—was the common view among Darwinists in the late nineteenth and early twentieth centuries (p. 114). This worldview was expressed in a proverb of Hitler: "The individual must and will always perish; only the Volk (the nation) must remain" (p. 115). This view was also common in communist nations and partly explains the estimated 80 million people the Chinese communists murdered and the 80 million individuals the Soviets murdered, as well as the 60 million the Nazis murdered—they claimed all for the good of the nation.

Weikart's study is required reading for anyone who wants to understand this central event in twentieth-century Western history. Research on the Nazi movement is now a small industry, and *Hitler's Ethic* adds greatly to our understanding of many aspects of one of the worst 12 years in world history, which claimed the lives of almost 100 million people and produced the Holocaust. We must not forget this event, and it is critical that we understand it to insure that it never happens again. The main area of debate that this book helps to clarify in much detail is not how Darwinism influenced Hitler but rather the exact nature of Darwin's influence on Hitler and Nazism.

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The Rise and Fall of the Orthogenesis Non-Darwinian Theory of Evolution

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Abstract

Orthogenesis is the theory that evolution occurs in a straight line, not branching, and is internally goal-directed. The theory was an attempt to explain the source of new genetic information in biological evolution. Although the theory boasted a number of prominent supporters, it did not survive scientific scrutiny and is now effectively moribund. The main problem with orthogenesis was that no plausible mechanism to drive straight-line evolution was ever demonstrated, and all of the examples used to support orthogenesis could be explained by other theories. Today the most widely accepted theory concerning the source of new genetic information is gene mutations. But mutation is regarded by some prominent biologists as an inadequate source of genetic novelty. It is important to study the doctrine of orthogenetic evolution because it prepares us to understand what may very well happen to the mutation-based evolutionary theory in the future.

Introduction

Starting with a living cell, evolution must scientifically theorize how one-celled organisms evolved into all of the many life-forms existing today, including multicellular humans. A fundamental problem that evolutionists face is identifying the source of new biological information required for all of this biological change. Every theory that has been advanced in the past to explain the origin of new biological information was eventually discarded as biological knowledge increased. Science historian Peter Bowler (1979, p. 70) wrote that the "rise and fall of orthogenesis represents an important component of the debate over the validity of Darwin's theory, which raged around the turn of the century."

It is now widely believed that several mechanisms are involved in creating new biological information, but orthogenesis is not one of them. Historically it was one of several major theories proposed to counter the numerous objections that were raised against Darwin's theory of evolution by natural selection. One objection to his theory was that random variations, acted on by natural selection, are not a sufficient mechanism by which evolution might produce the life-forms existing today.

> Darwin assumed that the variations of individuals occurred more or less at random, hence selection for advantageous characters was the main directing agent. But if variations were *not* random—if they tended to occur more readily in some directions than others—then the direction of variation might itself control the course of evolution, with selection

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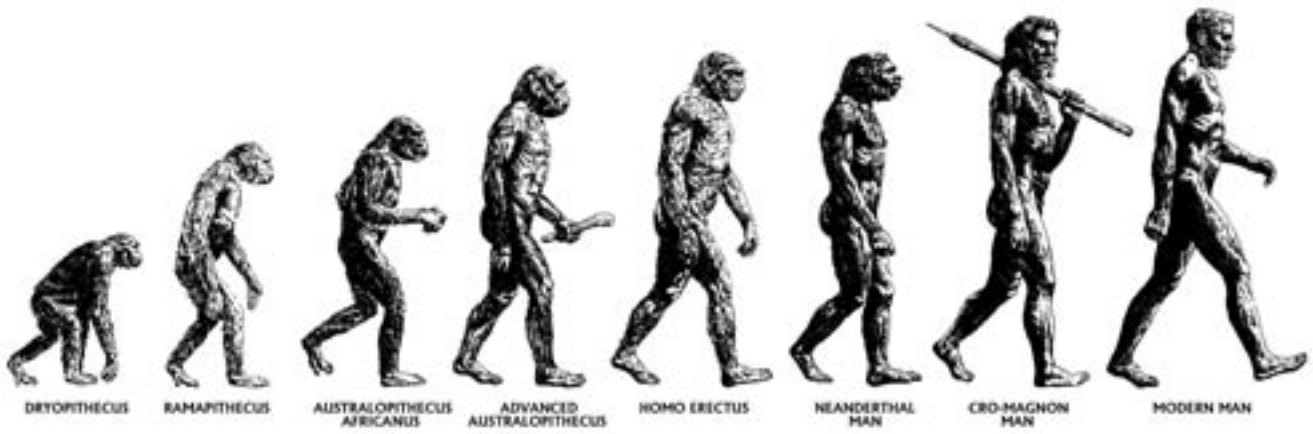

Figure 1. An example of straight-line evolution is the famous human evolution progression series which S. J. Gould (1989, p. 30) concluded is a gross distortion of the fossil evidence. (Illustrated by Richard Geer.)

> playing only the negative role of eliminating those directions that were harmful. 'Orthogenesis' was the name coined by Wilhelm Haacke … to designate the process of evolution by 'definitely directed variation' (Bowler, 1979, p. 40).

Specifically, a major criticism of Darwinism was the

> impossibility of explaining the beginnings of advantageous modification and the beginning of new organs, by the selection of fluctuating individual variation … and the admitted cases of forthright development along fixed lines not apparently advantageous (Kellogg, 1907, p. 274).

De Vries (1909, 1910) proposed mutations as the source of new biological information. This theory was initially greeted with skepticism by many biologists because other theories were considered more plausible to account for what appeared to be evolutionary progress. The extensive debate over orthogenesis and its implications was important because the theory initially "appeared to provide experimental disproof of Darwin's theory" of evolution (Bowler, 1979, pp. 40–41).

Classical Darwinism taught that natural selection is the major force imparting direction to evolution by eliminating the less well adapted organisms (Latham, 2005, p. 143). Conversely most orthogenesis theorists argued that natural selection does not significantly alter the predetermined orthogenesis path because they believed that evolution generally does not result from external factors as taught by Lamark or Darwin (Gould, 1977, pp. 79–90). A major reason for opposition to orthogenesis was that many evolutionists wanted "to leave as much as possible of the original structure of Darwinism intact" (Bowler, 1979, p. 41).

Orthogenesis: Description and Evidence

Orthogenesis, also called autogenesis, was popular for several decades among biologists as an explanation for providing new biological information (Milner, 1990, p. 345). The theory postulated an inherent tendency (bias, driving force, or potential) for organisms to "vary in certain directions, as ancestors vicariate or break apart into descendants" (Grehan and Ainsworth, 1985, p. 174). Called straight-line, "goal-directed" evolution, the theory concluded that the influence of internal "organismic forces" guiding genetic variation in specified directions was a critical factor driving evolution (for the most famous example, see Figure 1). The "internal drive" idea in orthogenesis was similar to vitalism, except that many of its advocates believed the mechanism driving evolution was a biological force, not an ethereal one as was proposed in vitalism.

This endogenous perfecting drive, or "law of growth," was believed to move organisms toward a specific or ultimate end goal, just as an embryo is driven to develop into an adult life-form by internal forces. Nägeli described the drive to perfection as resulting from "something inherent in the organic world which makes each organism in itself a force or factor making [progress] … towards progressive evolution" (Kellogg, 1907, pp. 277–278). Orthogenesists did not deny the influence of external factors but rather stressed that there must exist a combination of the two influences: external factors and an inherent driving force (Bowler, 1979, p. 50). Actually, there existed "two or three theories of orthogenesis which have been developed to the degree where they are boldly offered as substitutes for natural selection" (Kellogg, 1907, p. 277).

The term "orthogenesis" was popularized by Theodor Eimer, professor of zoology and comparative anatomy at Germany's Tübingen University, but the idea was much older. While a student and colleague of August Weismann, Eimer "grew increasingly dissatisfied with Darwin's selection theory, turning to both Lamarckism and orthogenesis as alternatives" (Bowler, 1979, p. 42). Eimer's principle line of evidence for orthogenesis came from his extensive study of butterflies, which he reviewed in a 513-page monograph (1897). In this work he "attributes evolution almost exclusively to development along definitely determined lines" (Dennert, 1904, p. 71). Eimer's book (Eimer, 1890) became a leading text in the orthogenesis movement. Some called his explanation of evolution an "endogenous perfecting principle" or force (Blomberg and Garland, 2002, p. 899).

Another early supporter of orthogenesis was the entomologist Vernon Kellogg. Kellogg had some reservations about Darwinism and

> was quite prepared to consider those alternatives that seemed to be supported by sound evidence. In particular he accepted the existence of some nonadaptive characters and the need to invoke a mechanism to explain them. He discussed Eimer's work at some length, emphasizing that (unlike Nägeli's theory) orthogenesis was scientifically respectable because it depended on external forces to elicit the variation (Bowler, 1979, p. 61).

Other well-known popularizers of orthogenesis included eminent botanist Carl Nägeli, German biologist Wilhelm Haeckel, biologists Leo Berg and Alpheus Hyatt, paleontologist Edward Drinker Cope, and the "giant of paleontology" Henry Fairfield Osborn (Colbert, 1994, p. 64). Additional advocates of orthogenesis included C. O. Whitman, the famous naturalist William Beebe, and renowned paleontologist O. C. Marsh (Larson, 2001). The concept also played a central role in the ideas of neo-Lamarkian philosopher and Nobel Laureate Henri Bergson, who accepted the elements of orthogenesis that supported his own theory, which he called "creative evolution" (1941, pp. 79–85). Ironically, even Darwin was impressed with some of the early orthogenesis concepts, calling them the "laws of growth" (Grehan and Ainsworth, 1985).

Osborn described evolution as an "explosion out from an ancestral form," such as adaptive radiation that spread into every conceivable ecological niche. He concluded that once a "perfect mechanism evolved, evolution stopped" and "adaptation to a different physical environment or habitual zone" was impossible (Ruse, 1996, p. 265). This conclusion explains why evolution seems to have stopped for many forms of life. Called "living fossils," they have not changed much since their initial appearance in the geologic record. Some of Osborn's major ideas go back to Edward Drinker Cope, a Lamarckian. Osborn saw evolution, not as a succession of distinct creatures, but rather as a continuous ascent of progress marked by increasing perfection of form, function, and beauty (Ruse, 1996, p. 268). One major attraction of orthogenesis was the fact that the "theory could infuse evolution with design, or at least purpose" (Larson, 2001, p. 101).

Orthogenesists argued that evolution in general progressed in a defined and restricted path from ancestors to descendants with only a few side branches (MacFadden, 1994). Its supporters concluded that evolution occurs as a result of the influence of internal forces that limit variation in specified directions. For this reason evolution follows a predetermined path that eventually leads to humans. Orthogenesists also asserted that evolution continues until a maximized structure evolves, at which point evolutionary change ceases and stasis prevails.

The evolution of organisms would be driven in one direction to a "state of perfection." The fossil record, which indicated a directional change toward common goals, seemed to support orthogenesis. The evolution of the horse was cited as one example. This is one reason why

> *orthogenesis* soon became popular, especially among the paleontologists. It is still associated largely with those trends observed in the fossil record that seem difficult to explain by natural selection (Bowler, 1979, p. 40).

Supporters of this once popular theory hypothesized that the many examples of life-forms that have gone extinct did so because in this straight-line, directional evolution certain characteristics evolved to excess or were unwieldy, causing extinction. Evidence of an orthogenic evolutionary mechanism includes the enormous Cretaceous reptiles that required prodigious amounts of food just to survive (Kellogg, 1907). The now-extinct Irish elk also was cited as prime support for the theory because the antlers evolved to become so large that they contributed to the animal's becoming extinct (Gould, 1977, pp. 84–85). Supporters of orthogenesis reasoned that the antlers would not have became so large if this trait was not predetermined, and natural selection could not have caused this trait to evolve because the large size of the antlers was clearly detrimental to survival (see Figure 2).

Another anomaly that orthogenesis was used to explain was the titanothere, a rhinoceros-like animal that was judged to have evolved well beyond its adaptive optimum. This example of orthogenesis was so important that Osborn wrote a whole monograph on it (1929) in which he argued that the titanothere had "nasal horns" that evolved to the extent that they seriously interfered with adaptation. He concluded that the horns first appeared in the fossil record only in adult titanotheres, but, as a result

Figure 2. The Irish elk *(Megaloceros)*, showing the enormous size of its antlers, so large that it had difficulity walking. Photograph taken from a mounted specium. From J.G. Millais. 1897. *British Deer and their Horns.* Henry Southeran, London, England.

of orthogenesis, they developed earlier and earlier until they appeared on the skull before birth, causing the animals' extinction (Ruse, 1996, p. 271).

D'arcy Thompson argued that evidence of orthogenesis exists in the progressive "gradual increase or decrease" in a trait such as size (1942, p. 807). He assembled scores of examples in his classic work, *On Growth and Form*, which has been reprinted numerous times, including an abridged edition edited by John Bonner (1966). Bonner concluded in the introduction to the abridged reprint that Thompson's book has had considerable influence in biology (1966, p. vii).

Horse Evolution as Further Evidence for Orthogenesis

Horse evolution from *Eohippus* to the modern horse was both the most common and best-supported example supporting orthogenesis theory (Simpson, 1967, p. 131). Orthogenesis asserted that animals evolved along certain lines or paths toward a predetermined goal that natural "selection based on utility [is] unable to explain" (Kellogg, 1907, p. 275). Professor Marsh, a paleontologist, attempted to confirm Darwinism by working out the history of horse evolution from the fossil record (Milner, 1990). Marsh collected a magnificent set of fossil horses and then attempted to trace its evolution

> from a small three-toed animal "the size of a fox" through larger animals with progressively larger hooves, developed from the middle toe. Darwin thought Marsh's sequence from little *Eohippus* ("Dawn horse") to modern *Equus* was the best evolutionary demonstration anyone had produced in the 15 years since the *Origin of Species* (1859) was published (Milner, 1990, p. 220).

Marsh arranged his fossil collection in such a way that it would

> "lead up" to the one surviving species, blithely ignoring many inconsistencies and any contradictory evidence. Ironically, his famous reconstruction of horse evolution was copied by anthropologists. They, too, thought they saw a straight-line lineage "leading up" to the sole surviving species of a once-varied group: *Homo sapiens* (Milner, 1990, p. 220).

British biologist Thomas Henry Huxley was greatly impressed with Marsh's progressive series of fossil horses when he visited Marsh's lab. Marsh's classic orthogenic, unilinear horse evolution soon became

> enshrined in every biology textbook and in a famous exhibit at the American Museum of Natural History. It showed a sequence of mounted skeletons, each one larger and with a more well-developed hoof than the last. (The exhibit is now hidden from public view as an outdated embarrassment.) (Milner, 1990, p. 220)

Convergent Evolution Was Used as Evidence

One variant related to orthogesis included a theory that was developed by leading evolutionist H. Osborn, a theory called "aristogenesis" (Witham, 2002, p. 30). Osborn argued that the common observation called evolutionary parallelism—today called convergent evolution—was persuasive evidence for orthogenesis. Convergent evolution is when animal structures evolve along discrete, but similar, lines to yield very similar structures (Colbert, 1994, p. 64). Thus, wings are believed to have evolved separately at least three times (in birds, bats, and pterodactyls), forming remarkably similar structures. To Osborn these examples proved the existence of the orthogenetic inward drive. How else could so many animals evolve in totally separated and very different environments into animals that were so very similar that the same common name is used for both, such as placental mole and the marsupial mole?

Howe (1965, 1972, 1999, and 2000) has summarized and evaluated the evidence for convergent evolution. He

Figure 3. Henry Fairfield Osborn, the head of the American Museum of Natural History. (From the author's collection.)


ORGANIC EVOLUTION

INHERITANCE OF ACQUIRED CHARACTERS

LAWS OF ORGANIC GROWTH

J. T. CUNNINGHAM, M.A., F.Z.S.

MACMILLAN AND CO.

Figure 4. One of the most important books of the orthogenesis movement, Eimer's (1890) *Organic Evolution as the Result of the Inheritance of Acquired Characters according to the Laws of Organic Growth.*

attributed it instead to the Creator's versatility by producing wings, echolocation, or similar structures in animals that are taxonomically widely separated. Howe asserted such parallelism supports creation, not evolution.

Examples of convergent evolution of entire organisms include many placentals, such as the wolf, ocelot, anteater, flying squirrel, groundhog, and mouse, all which have remarkably similar marsupial counterparts in animals that must have had totally different evolutionary lineages. See Table I for the corresponding placental and Australian marsupials. This table shows the extent of which ecological counterparts are found in two very distinct zoologies groups. This parallelism is such a degree that it could not have arisen by any kind of evolutionary process.

Table I. Corresponding placental and Australian marsupials.

Placental Mammals	Marsupial Mammals
Wolf (*Canis*)	Tasmanian Wolf (*Thylacinus*)
Ocelot (*Felis*)	Native Cat (*Dasyurus*)
Anteater (*Myrmecophaga*)	Anteater (*Myrmecobis*)
Flying Squirrel (*Glaucomys*)	Flying Phalanger (*Petourus*)
Groundhog (*Marmota*)	Wombat (*Phasolmys*)
Mouse (*Mus*)	Mouse (*Dasycercus*)
Placental Mole	Marsupial Mole
Lemer	Spotted Cuscus
Saber-toothed placental (*Similodontidae*)	Saber-toothed marsupial (*Thylacosmilidae*)

Orthogenesis and convergence are often assumed to be the same because both were used by anti-Darwinians. However, orthogenesis postulates parallel evolution driven by nonadaptive trends in related species; in contrast, convergence is a theoretical process by which unrelated organisms independently adapted to similar habitats or lifestyles. Lamarkians believed their theory of use-inheritance could better explain "convergent evolution," and they postulated that much more convergence existed than the Darwinians postulated. Bergson (1941) concluded that only orthogenetic evolution can

> account for the building up of identical complex organs on independent lines of development. For it is quite conceivable that the same effort to turn the same circumstances to good account might have the same result, especially if the problem put by the circumstances is such as to admit of only one solution (p. 86).

Teilhard and Orthogenesis

Orthogenesis was further popularized by Jesuit paleontologist Teilhard de Chardin. He argued for an orthogenetic evolution that would eventually reach a state of perfection, which he called the "Omega Point." De Chardin wrote that without orthogenesis life would only have merely spread out, but with it the ascent of life became "inevitable" (1959, p. 109).

Opposition to Orthogenesis by Simpson and Others

Close to a century after Marsh's horse exhibit first appeared in the American Museum of Natural History, the paleontologist George Gaylord Simpson reexamined horse evolution and "concluded that generations of students had been misled" (Milner, 1990, p. 220). Simpson (1951, pp. 163–171) effectively documented that no simple, gradual, unilinear evolution of horses had occurred in history. He argued that horse evolution was not gradual but rather very "jerky," displaying clear evidence for punctuated equilibrium. Teeth, toes, and even body size "varied in different lineages, independently of each other" (Milner, 1990, p. 220). The pattern documented by the fossil evidence, Simpson concluded, is better explained by opportunism and the tendency for natural selection to favor larger animal sizes (Simpson, 1967, p. 131). He concluded that orthogenesis did not provide an adequate explanation of horse evolution (Simpson, 1953).

Another orthogenesis critic was August Weismann, who recognized "that the traditional Darwinian theory was inadequate," and developed his own theory, called the *germ plasma* theory (Bowler, 1979, p. 56). Ironically, Weismann accepted orthogenesis as a "minor addition to natural selection" but concluded that its influence was limited to particular developments by individual species (Bowler, 1979, p. 53). Weismann argued that most of the variation driving evolution was caused by random genetic changes and natural selection.

Ultimately, orthogenesis fails to explain the source of the "unknown inner forces inherent in organisms" that moved the organism "toward some ideal goal," which many saw as a "mystic essentially teleologic force" (Kellogg, 1907, p. 278). Simpson was opposed to orthogenesis because he concluded it required "some mysterious inner force" that cannot be explained by science (Simpson, 1953, p. 125).

The Theory's End

The orthogenesis theory has now largely been abandoned because no plausible physical mechanism for the postulated internal drive that caused life to evolve in a specific direction was ever found (Ruse, 1996; Simpson, 1967). Another major problem was that the fossil record does not support "straight-line" evolution, a fact that was called the "paradox of stasis" by Hendry.

> The most obvious manifestation of this paradox is that neo-Darwinian theory, with its emphasis on the power of selection, predicts the potential for rapid adaptation, whereas most lineages of organisms instead show long-term stasis: that is, very little cumulative change over long periods of time (Hendry, 2007, p. 147).

A further reason for the rejection of orthogenesis was that the examples used to support it have all been shown to have many exceptions and irregularities or are just plain wrong. Observations that orthogenesis purported to explain were better explained by other theories or remain unexplained.

Simpson was the most influential critic of orthogenesis. He asserted that evolution in general does not proceed in straight lines but rather "only a tendency" to do so existed "with so many exceptions as hardly to constitute a rule" (1967, p. 133). One of the most fundamental objections to orthogenesis was that it was advocated by "vitalists and finalists," while Darwinism was supported by a large number of persons who vehemently rejected the conclusion that "direction" exists in evolution (Simpson, 1967, p. 132).

In spite of a lack of evidence, the orthogenesis idea persisted for decades and is still ingrained in both "modern scientific thought and in everyday society in general" (MacFadden, 1994, p. 27). It was recently resurrected by Calvin College physics professor Howard Van Till. His theory concluded that a "complete initial creation" and an inbuilt "robust foundational formational economy" are responsible for the creation of all things, living and nonliving (1990, pp. 112–115). According to Van Till the innate properties necessary to bring about "all of the diverse physical structures and life-forms that have appeared in the course of time" without outside intervention were built into the nonliving building blocks of the universe (Van Till, 1990, p. 85). This form of vitalism credits God with constructing the seeds of life very early in the universe, and for this reason life contains the drive to perfect itself. This view is simply another form of theistic evolution and orthogenesis.

Summary

Darwin described his theory of evolution as merely "a provisional hypothesis or speculation," but he believed it was the best extant theory that could explain the origin of the species, and that "until a better one [can] be advanced, it will serve to bring together a multitude of facts which are at present left disconnected by any efficient cause" (Darwin, 1896, p. 350). In the decades around 1900, a number of non- and neo-Darwinian theories were developed, including orthogenesis, in an attempt to explain the origin of new biological information. Most of these theories have now been discarded (Bowler, 1983). The lethal problem with orthogenesis was that there was no known mechanism to account for an endogenous perfecting force.

No post-Darwinian theory has yet achieved the popularity of neo-Darwinism. Some biologists have tried to resurrect a form of orthogenesis called "phylogenetic inertia," which is the idea that once an organism begins to evolve in a specific direction, it tends to keep evolving in that way (Blomberg and Garland, 2002).

Clearly, "evolutionary theory is a tumultuous field where many differing views are now competing for dominance" (Esensten, 2003, p. 2). The history of the rise and fall of orthogenesis supports the idea that evolutionism has always been a "tumultuous field" and will continue to be such. Meanwhile, the collapse of each new philosophical attempt to explain the source of novelty in biology is additional support for the creation origins views. The neo-Darwinian concept of mutations and natural selection may well also be discarded when its limitations are more fully understood.

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The Origin of Grand Canyon

Part IV: The Great Denudation

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Abstract

The Great Denudation is the uniformitarian name for the massive erosional event that stripped tremendous volumes of sedimentary rock from the surface of the Colorado Plateau. Like the origin of Grand Canyon, this event remains inexplicable to uniformitarian geology. However, any hypothesis of the origin of the Canyon must account for the conjunction of these two very large-scale, yet very different events. The Great Denudation was accomplished by east to northeast flowing sheets of water, which left a cobble and boulder lag—the Rim Gravel—on the southwest Colorado Plateau. Uniformitarians propose erosion by northeast flowing streams, but there is no sedimentary evidence for their depositional activity, and the sheet-like erosion is not consistent with observed styles of fluvial erosion. However, the Great Denudation can be easily explained by the sheet-flow phase of the Flood, which occurred early in the retreating stage. Evidence for a single, great, and rapid erosional event is found in the nature of the rocks capping the top two stairs of the Grand Staircase.

Introduction

The origin of Grand Canyon has puzzled geologists for nearly 150 years. Uniformitarian hypotheses—which all assume that the present or a past river eroded the Canyon—have proven unable to explain field observations. Understanding the genesis of the Canyon requires two assumptions not commonly held. The first admits the possibility of catastrophic erosion of the Canyon independent of the Colorado River, and the second recognizes that the problem is ultimately one within the discipline of geomorphology.

Having shown all three uniformitarian models fail to account for the evidence, this series has examined popular creationary models centered around the catastrophic emptying of post-Flood lakes upstream of the Canyon. These models rely on dam breaching of natural barriers and implicitly draw on the analogy of the well-studied glacial Lake Missoula flood that carved the Channeled Scabland of the Pacific Northwest. However, the field data from that area are not matched by similar features on the Colorado Plateau. The absence of sedimentary and geomorphological evidence for the lakes and the necessity of widespread and simultaneous erosion of Grand Canyon and its tributaries strongly suggest that these dam-breach models do not provide adequate explanation for the Canyon's origin.

A better explanation is found in the two-phase action of retreating Flood-

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Figure 1. Planation surface of the Grand Canyon area. View is north northeast from the top of Red Butte. Notice the North Rim of the Kaibab Plateau in the background and how the Coconino Plateau slopes up toward the east with the North Rim disappearing.

water during the last half of the Flood. Clearly, the retreat of the Flood off of the continents would have eroded significant amounts of sediment and sedimentary rock. From a geomorphological perspective, many landforms of Earth's surface, including water gaps such as Grand Canyon, can be related to the two phases of the Flood (Oard, 2008). The retreating stage of the Flood can be divided up into the sheet-flow phase and the subsequent channelized-flow phase. Before examining the erosion of the Grand Canyon during the channelized-flow phase, we must understand the broader erosive phase during the sheet-flow phase. That event is what the uniformitarians call the "Great Denudation."

Phase I: Sheet Erosion of the Colorado Plateau

The Grand Canyon is a stark testimony to the power of moving water, especially once it becomes clear that it formed catastrophically. It is staggering to realize that between 6,000 and 10,000 ft (1.83–3.05 km) of sedimentary rock was eroded from the southwest Colorado Plateau *before* Grand Canyon was cut! Even more staggering is the fact that the entire Colorado Plateau was stripped of an average of 8,200 to 16,400 feet (2.5 to 5.0 km) (Schmidt, 1989). No one observed the process, but we can infer much of what happened by examining the remnant—a nearly flat planation surface in the Grand Canyon area (Figure 1).

Even though this initial large erosion surface has since been warped by broad uplifts and subsidence—forming the Kaibab and Coconino plateaus, the Marble Platform, and the other smaller plateaus—all geologists who have investigated this region agree that this large-scale planing of the Colorado Plateau occurred. They refer to this erosion as the *Great Denudation*, a term coined by Clarence Dutton in 1882. Dutton was one of the early geologists to study the Colorado Plateau and its denudation. Denudation has a wider meaning than erosion, including all the processes that result in the wearing away or the progressive lowering of Earth's surface by weathering, mass flow, and transportation. Powell (2005, p. 219) summarized: "One fact on which Grand Canyon geologists have always agreed is the reality of Dutton's 'Great Denudation.'" It was only after the Great Denudation that Grand Canyon and other canyons were cut in the second phase of erosion in what Dutton called the *Great Erosion*. Both the Great Denudation and the Great Erosion are based on reasonable deductions of observational evidence.

The Great Denudation

Creation scientists agree with Powell's assertion, since the field evidence is overwhelming. The Great Denudation can be best seen as sheet erosion, since it was so laterally extensive. Based on the gently northeastward dipping strata of the erosional escarpment of the Grand Staircase (see Figure 3 in Oard, 2010a), as much as 10,000 ft (3.05 km) of strata were eroded, roughly as a sheet, from the area around Grand Canyon, leaving a large, flat planation surface that forms the top of Grand Canyon (Figure 1). Since strata can vary in thickness over

Figure 2. Recently formed Providence Canyon, Georgia.

an area, the total amount of erosion is unclear, but a conservative estimate would be 6,000 ft (1.83 km). Thus, a greater thickness of sediment was eroded *as a large sheet* than was eroded when Grand Canyon was cut.

In fact, the volume of strata removed during the Great Denudation was *100 times* that removed from the Grand Canyon itself (Potochnik, 2001). The sheet erosion left only a few remnants, such as Red Butte south of Tusayan, at about 7,370 ft (2.25 km) msl (Figure 3), Cedar Mountain at 7,053 ft (2,150 m) msl on the East Kaibab Monocline (Figure 4), and Shinumo Alter on Marble Platform east of the Colorado River, at 6,520 ft (1.99 km) msl (Figure 5). All these erosional remnants are about 1,000 ft (305 m) above the surrounding planation surface. Erosional remnants only 1,000 ft (305 m) high remained after eroding over 6,000 ft (1.83 km) only because sheet erosion was so pervasive and the tops of the erosional remnants are capped by hard rock. Red Butte is capped by a local or regional lava flow above the hard Shinarump sandstone and conglomerate, while the other two are capped by the Shinarump sandstone and conglomerate.

Similar large-scale sheet erosion occurred over other areas of the Colorado Plateau, but the term "*the Great Denudation*" refers to the Grand Canyon area. Ranney (2005, p. 67–68, emphasis mine) summarizes the horizontal style of erosion during the Great Denudation followed by the vertical dissection during the Great Erosion:

> [Dutton] recognized that strata composing the Grand Staircase (a name he invented), once covered the Grand Canyon region, only to be stripped away in what he called the Great Denudation. He theorized a later period of canyon cutting, which he termed the Great Erosion. Dutton therefore, was the first geologist to differentiate between two cycles of erosion: one that created the Grand Staircase by the *lateral* stripping of strata and one that created the Grand Canyon through *vertical dissection*. These two very different periods of erosion led to the landscape seen today.

It is important to distinguish between the two cycles of erosion. The initial phase of sheet erosion did not carve the canyons. In fact, Grand Canyon may not have existed after the Great Denudation, although some geologists think that canyons on the Hualapai Plateau, the southwest plateau of Grand Canyon, and Peach Springs Canyon were cut during this time (Graf et al.,

Figure 3. Red Butte, South Rim, as seen northeast from Forest Road 320 a little east of Highway 64.

1987). William Morris Davis, the father of geomorphology, who wrote in the early 1900s, agreed with Dutton on this two-phase erosional cycle. He called the first phase the "plateau cycle" and the second phase the "canyon cycle." Similarly, Morris understood that the plateau cycle resulted from lateral erosion, while the canyon cycle resulted from vertical dissection. Herbert Gregory (1950), an early investigator of the Colorado Plateau in the twentieth century, also agreed with this two-stage erosional pattern. As with subsequent researchers, Gregory could not help adding new names for the two phases. He called the two cycles the "precanyon cycle" and the "canyon cycle," and attributed both to regional uplift.

Uniformitarian geologists have never been able to reasonably explain the differences between these two cycles. After all, if both were caused by the same mechanism, then why were the results so radically different? Another problem is the violation of the uniformitarian principle by the first phase of large-scale sheet erosion. Erosion in the present happens by the dissection of landscapes by streams and rivers (Figure 2). Planation surfaces also are not being formed today. Ranney (2005, p. 24, 47, emphasis mine) puzzles over Dutton's two different erosional processes that occurred in the same area but at different times:

> It may not be readily apparent to the non-geologist that these flat, highly elevated plateaus [of the Grand Staircase] are worthy of discussion but it is likely that they formed at a *different time* under *different*

Figure 4. Cedar Mountain on the East Kaibab Monocline (view east from Desert View overlook).

Figure 5. Shinumo Alter on Marble Platform (view south from Highway Alt. 89, milepost 554).

> *erosional processes* than the deep canyons that dissect them. What sequence of geologic events could have produced such a strikingly different set of landforms so close to one another…. Erosion at that time [during the first phase] must have been *much different* than what we see today. Broad, planar erosion most likely removed thick sheets of sedimentary strata that used to sit upon the plateau surface above Grand Canyon.

It is interesting to note that the episode of sheet erosion occurred only after significant thicknesses of strata, labeled Paleozoic and Mesozoic by uniformitarian geologists, had been laid down over a large region. What makes the Great Denudation even more intriguing is that there are extremely few indications of erosion *within* the beds of these thick strata or at their contacts. This is seen in the horizontal strata along the walls of Grand Canyon (Vail et al., 2008). Despite the fact that these contacts are interpreted to show millions to tens of millions of missing years according to the geological timescale, the physical evidence of any erosion is missing and likely never happened.

Proposed Uniformitarian Mechanism for the Great Denudation

Uniformitarian geologists are not even sure of the timing of the erosional event. It is placed in the early Cretaceous by Potochnik (2001), but in the early Tertiary by Ranney (2005). Davis also believed the Great Denudation was in the early Tertiary (Ranney, 2005). Gregory (1950) set it in the middle Tertiary, with the canyon-cutting cycle in the late Tertiary. It is obvious that much of the Great Denudation occurred during the "Tertiary" because there are several eroded anticlines on the Colorado Plateau that cut Tertiary strata, especially the Grand Staircase and the north limb of the San Rafael Swell.

Working within their uniformitarian paradigm, geologists attempt to explain the Great Denudation by modern processes—invoking ordinary streams flowing *northeastward* (Potochnik, 2001; Ranney, 2005). Today, however, erosion by streams and rivers is predominantly vertical. As exhibited by the cutting of modern canyons and valleys, today's erosional processes do not erode in sheets, creating planation surfaces. Planation surfaces of more than a few tenths of a square mile do not form by stream erosion (Crickmay, 1974; Oard, 2008). Only rarely, and on a very small scale, a river will overflow its banks in a flood and truncate tilting strata (Crickmay, 1974).

So, the Great Denudation and the formation of planation surfaces go against the uniformitarian principle. Unless such present-day river erosion of tilted strata can be scaled up to that of existing planation surfaces (sometimes more than 1,000 mi^2 [2,590 km^2] in area), some other mechanism is needed to explain these surfaces. Another important piece of field evidence is the northeastward flow during the Great Denudation, reinforced by paleocurrent indicators in the Rim Gravel. Furthermore, the reason why erosion should be so different in the two phases remains unexplained. If regional uplift was the cause of both, why was one phase so much different from the other? Although

uniformitarian hypotheses have no answer, a Flood model answers these questions with its two-phase retreat of water off of the continent.

The uniformitarian principle is also violated by the necessity of a tremendous volume of water to erode and plane the Colorado Plateau and then to carve Grand Canyon. Despite the arid nature of the region today, it was once the home to vast amounts of running water.

As geologists starting with Newberry showed, erosion by running water has produced the topography of the Southwest, with its high plateaus and deeply etched canyons (Powell, 2005, p. 221).

If erosion really occurred by streams operating over long periods of time, we should see remnants of their erosional products on the Colorado Plateau in the form of stream terraces, flood plains, and ancient lakes. We should see a huge amount of eroded sediment east of the Colorado Plateau in the Midwest. However, there is little Cenozoic strata on the Colorado Plateau (Potochnik, 2001), which makes it extremely difficult to discuss details of what happened during and after the Great Denudation. The Cenozoic strata of the High Plains are mostly volcaniclastic debris, reworked by water and wind. Carlson (1993, p. 48) stated in regard to the Cenozoic deposits in Nebraska and the High Plains, "However, the majority of the material was provided by numerous volcanoes active over western North America." So, the absence of the sedimentary load of the Great Denudation suggests that it was swept *off* the Colorado Plateau and probably *off the continent*, since it is not found on the continent. That missing sediment is likely part of the very thick sedimentary rocks in the lower Mississippi River Valley and the continental margin of the Gulf of Mexico. This may not be consistent with the uniformitarian model, but fits well with the Flood model.

The Rim Gravel Shows Flow Direction Toward the East to Northeast

The Rim Gravel, composed predominantly of exotic cobbles and boulders, is found on the highest terrain of the southwest edge of the Colorado Plateau, called the Mogollon Rim (Figure 6). The boulders were rounded by water during a large-scale erosional event south and west of the present Mogollon Rim (Oard and Klevberg, 2005). Boulders are generally found on ridge *crests* at elevations of 6,900 to 7,900 ft (2.1–2.4 km) (Scarborough, 1989). It is worth noting that the Rim Gravel is probably also found *north* of the Grand Canyon (Elston and Young, 1991; Lucchitta, 1989), indicating that the canyon did *not* exist when it was deposited. However, Hill and Ranney (2007; 2008) dispute this claim and state that the quartzite cobbles and boulders north of Grand Canyon are from quartzite outcrops to the west in the Basin and Range Province. Since Hill and Ranney were trying to justify an old paleo-canyon, it is reasonable that they would argue against a widespread distribution of the Rim Gravel. Until more evidence for their position is presented, it is likely that the Rim Gravel originally was deposited as a sheet over the entire southwest Colorado

Figure 6. Mogollon Rim in background east northeast across the Verde Valley from the Black Hills west of the old mining town of Jerome, northeast of Prescott.

Figure 7. Quartzite boulder with abundant percussion marks just south of the Mogollon Rim, 4.5 miles (7 km) south of Arizona highway 260 on forest road 512, southwest of Heber, Arizona.

Plateau, but has since been reduced to scattered remnants by later erosion.

The Rim Gravel includes rocks eroded from the nearby sedimentary formations, as well as *exotic* rocks transported from a moderate distance, such as quartzite, granite, and gneiss. The quartzite boulders contain percussion marks (Figure 7), indicative of high-speed turbulent flow (Klevberg and Oard, 1998; Love et al., 2007). The most amazing aspect of the Rim Gravel is that the exotic rocks came from the west or the south—areas of significantly lower elevation today! The present topography of the area was much different when the Rim Gravel was deposited.

We know the origin of the rocks from current direction indicators found in the gravel and from examining the nearest source of the exotic gravel. Since the Mogollon Rim is an erosional feature rather than a structural feature, we know that the terrain to the west and south has been eroded even more than the southwest Colorado Plateau. The elevation difference was not caused by faulting because the Mogollon Rim is an erosional scarp, not a fault scarp. Since the deposition of the Rim Gravel was the last event in the Great Denudation, leaving behind a capping of cobbles and boulders on the southwest rim of the Colorado Plateau, this massive erosion must have occurred from the west and southwest by massive currents flowing toward the east to northeast. Even if the quartzite gravel north of Grand Canyon is not true Rim Gravel, but originated from the west, the deduction of east-flowing currents still stands. Furthermore, the velocity of these currents was high enough to transport boulder-size clasts and create percussion marks on hard quartzites. Interestingly, this direction is consistent with the tendency of Flood currents to flow from west to east in the Northern Hemisphere due to the spin of the Earth, according to Baumgardner and Barnette (1994).

The Great Denudation by the Sheet-Flow Phase of the Flood

The Great Denudation with its Rim Gravel remnants is not only difficult for uniformitarians to explain, but the scale, water velocity, and extent of erosion are contrary to uniformitarianism. Great amounts of strata were literally stripped from large areas of the Colorado Plateau (and even more were eroded from areas to the southwest). It appears that this episode was one event, since the Rim Gravels speak of synchronous deposition. If the currents deposited the gravels at the same time, then the same currents probably eroded the area at the same time too.

So once we peel away the uniformitarian assumption, the field evidence speaks of a catastrophic erosional event over a large area, removing thousands of feet of sedimentary rock far away and leaving a lag of gravels at the highest elevations of the plateau. The remains of the eroded sedimentary rock are seen in the Grand Staircase, and in the Vermillion and Echo Cliffs northeast and east of the Kaibab Plateau.

The lateral extent of the erosion is seen by erosion to the south and west of the Mogollon Rim, and similar erosion on the northwest Colorado Plateau along the edge of the Roan and Book Cliffs in northeast Utah, north and east of the San Rafael Swell (see Figure 4 in Oard, 2010a). On the northern limb of the San Rafael Swell, approximately 14,000 to 17,000 ft (4.3 to 5.2 km) of sedimentary rock was eroded, up to and including the "Tertiary" Green River Formation (Oard and Klevberg, 2008). Although uniformitarians are puzzled by the scale and extent of erosion, it fits well within the predictions of the Genesis Flood. As an aside, the erosional pattern strongly suggests that the Green River Formation was deposited during the Flood.

Another indication of regional- to continental-scale water flow is seen in the absence of the eroded sediment. If not deposited nearby, then it must have been transported far to the east—probably even into the Gulf of Mexico. There is no conceivable manner by which this could have happened by low-

energy streams operating over millions of years. But this is consistent with the regional-scale currents of the retreating Floodwater—first as large sheets and then as discrete channels.

The Rim Gravels show that these sheets were flowing east to northeast during the Great Denudation. The depth of erosion and the size of the boulders in the Rim Gravel give an indication of the high current velocities. Another indication of these Flood currents is found in the presence of vast amounts of sediment deposited at the continental margins—exactly where their transition to deeper water and slower velocities would cause the deposition of large, seaward thickening wedges of sediment.

Walker (1994) described the retreat of the Flood in two phases: the sheet-flow phase and the channelized phase. This is exactly what we see in the field evidence of the Colorado Plateau. Flood currents would cause sheet erosion and carry the resulting debris to the margin of the continent, forming the continental shelf and slope. Erosion from these large sheets would be laterally extensive, not narrow, and thus would form planation surfaces, not valleys and canyons. This is precisely what uniformitarian geologists have described in the Great Denudation. Early in the retreating stage of the Flood, prior to significant exposure of mountains and high plateaus, Flood currents would generally be moving from west to east on the Northern American continent due to the Coriolis force (caused by Earth's rotation), according to Baumgardner and Barnette (1994).

Baumgardner and Barnette (1994) showed that the Coriolis effect would produce strong, large water currents of 90 to 180 mph (40–80 m/sec) over submerged areas greater than 1,560 miles (2,500 km) in diameter and shallower than about 5,000 ft (1,525 m). The water currents were mostly moving counterclockwise in the Northern Hemisphere. This experiment was quite simple in that it was performed on a totally flooded earth with one large continent. The idea of one continent may not apply. In a more realistic Flood scenario with more chaotic bottom depths, always changing due to tectonics, erosion, and sedimentation, and variable sizes of shallow submerged areas, the currents likely would be more chaotic and of significantly less velocity. However, in a similar experiment Prabhu et al. (2008) showed a considerably different result with currents over shallow ocean bottoms moving clockwise with less than half the current velocity as in Baumgardner and Barnette's experiment. The radical difference in the results of the two studies has not been resolved (personal communication with Baumgardner). Regardless, the principle still applies that over large, relatively shallow areas currents would be generally strong during the Flood.

Figure 8 shows an example of these high-speed currents on the Northern American continent while the continent was submerged at less than 3,280 ft (1,000 m), according to Baumgardner and Barnette's (1994) model. Although the currents are generally flowing from west to east, some currents move toward the southeast and some toward the northeast. So in the area of the modern Colorado Plateau, sheet erosion probably occurred as the region was rising early in the retreating stage of the Flood. It is possible that the planation surfaces cut in the southern and central Rocky Mountains (Madole et al., 1987) occurred at the same time of the Great Denudation.

The continental extent of these Flood sheets is seen in the same west-to-east flowing sheets evidenced in the northwest United States by the erosion of quartzites and their spread eastward into Wyoming, Montana, and adjacent Canada (Oard et al., 2007). This transport started from west of the present-day continental divide and ended well east of the divide, indicating that today's continental divide had not yet formed. Thus, the west-to-east currents also would have been controlled by the Coriolis force during the sheet-flow phase of the Flood. The subsequent

Figure 8. Strong currents on flooded "continents" at an initial depth of 1,640 feet (500 m). The "ocean" depth is 13,054 ft (3.98 km) and the water starts with no motion. This snapshot shows current velocities up to 136 mph (219 kph) in 30 days caused by earth's rotation. The current is wavy with generally west to east flow at mid latitudes. The light colored pattern in the middle of the velocity loops (troughs) shows where the water level dropped to the bottom of the continent. Drawing by Peter Klevberg from Baumgardner and Barnette (1994, p. 80).

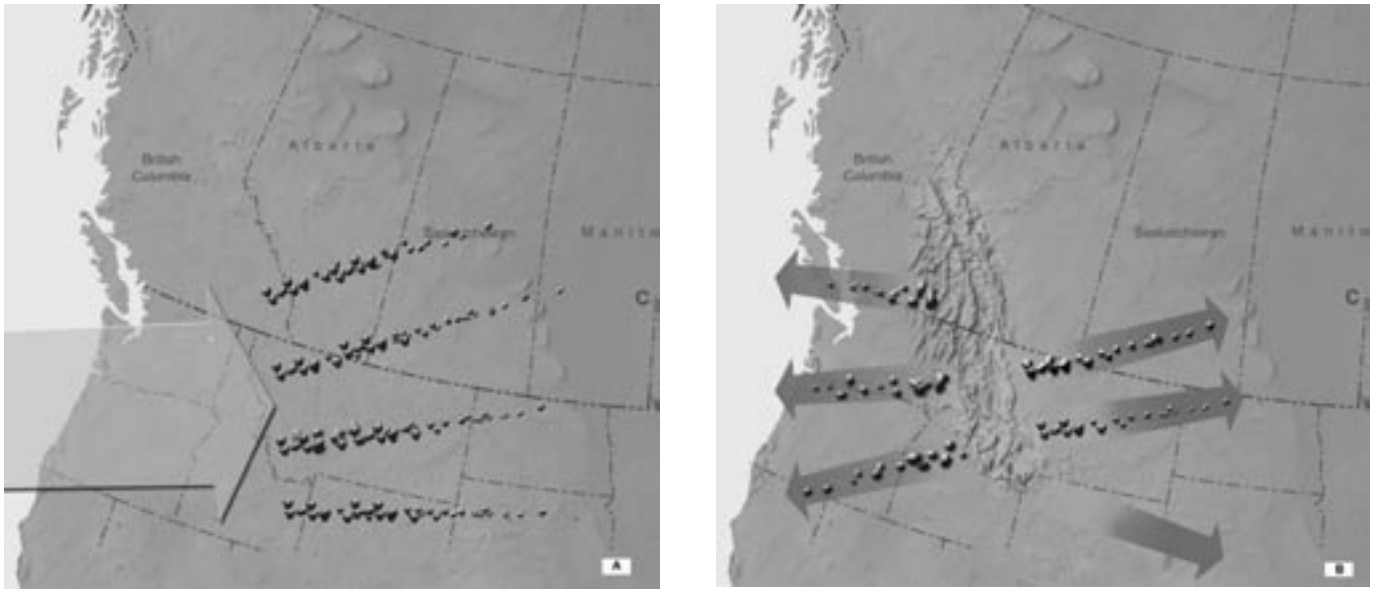

Figure 9. Source and distance of transport of quartzite rocks from the western Rocky Mountains west of the Continental Divide. Note that the size of the rounded quartzites decreases down current toward the east (A), and that once the Rocky Mountains are exposed above the Floodwater, quartzite cobbles and boulders are spread both east and west (B). Drawing by Bryan Miller.

uplift of the Rocky Mountains broke up the currents, which would then be diverted to flow perpendicular to the new continental divide. Because the water level was continually moving lower, the sheets would transform into broad channels as they encountered terrain obstructions that they could no longer plane (Figure 9).

Evidence of Rapid Erosion

Another evidence for the Flood model is found in the evidence for rapid erosion during the Great Denudation. This evidence is found in the rock capping the stairs of the Grand Staircase. The Grand Staircase is composed of a series of plateaus, separated by escarpments—hence its name, the *Grand Staircase*. The highest elevation is found on the Aquarius Plateau, at about 11,300 ft (3.44 km) msl, which then descends down to the plateau just north of Grand Canyon (see Figure 3 in Oard, 2010a). Crickmay (1974, p. 238) noted the perplexing erosional relationships between the strata capping the Table Cliffs Plateau, the second highest plateau, and the amount of erosion in the area:

> For example, nothing strikes a visitor more than the preservation of upland surfaces in the High Plateau country of Utah; particularly, the vertical succession of survivals. One of the highest is the Aquarius Plateau, formed on top of about 600 m [1,965 feet] of resistant lavas. But, protruding from below these volcanics, stands the Table Cliffs Plateau composed of the erodible [sic] Wasatch formation, from which the resistant capping of volcanics has been stripped; nevertheless the unresistant formation has maintained a plateau form while the surrounding country, over vast areas, has been lowered another 1200 m [3,930 feet] or more.

If we closely follow what Crickmay is saying, we see that the hard lava of the Aquarius Plateau eroded first, exposing the soft strata of the Wasatch Formation (now the Claron Formation). Then about 4,000 ft (1.21 km) of strata below the Claron Formation was eroded to the south, while the *soft* Claron Formation capping the Table Cliffs Plateau was hardly eroded. Greater precipitation at higher elevations should have favored the erosion of the soft strata at the higher elevation of the Table Cliffs Plateau. Figure 10 shows the Aquarius and Table Cliffs plateau from Bryce Canyon National Park, and Figure 11 shows the sequence of events as seen by Crickmay. The only way such an erosional pattern can occur is if erosion of the lava happened *rapidly* and not over many tens of millions of years, as envisioned by uniformitarian geologists. This implies that the entire Grand Staircase was eroded rapidly.

Another indication of rapid erosion for the Grand Staircase and Grand Canyon area (the southwest Colorado Plateau) is the existence of Navajo Mountain near the Utah/Arizona border about 82 miles (131 km) northeast of Grand Canyon. This mountain stands 10,388 feet (3,048 m) above sea level. It is a volcanic mass that formed

Figure 10. Aquarius and Table Cliffs Plateaus. The Aquarius Plateau is to the left on top of the dark colored volcanic rocks (arrow). The Table Cliffs Plateau is to the right and is on top of the white colored band (arrow).

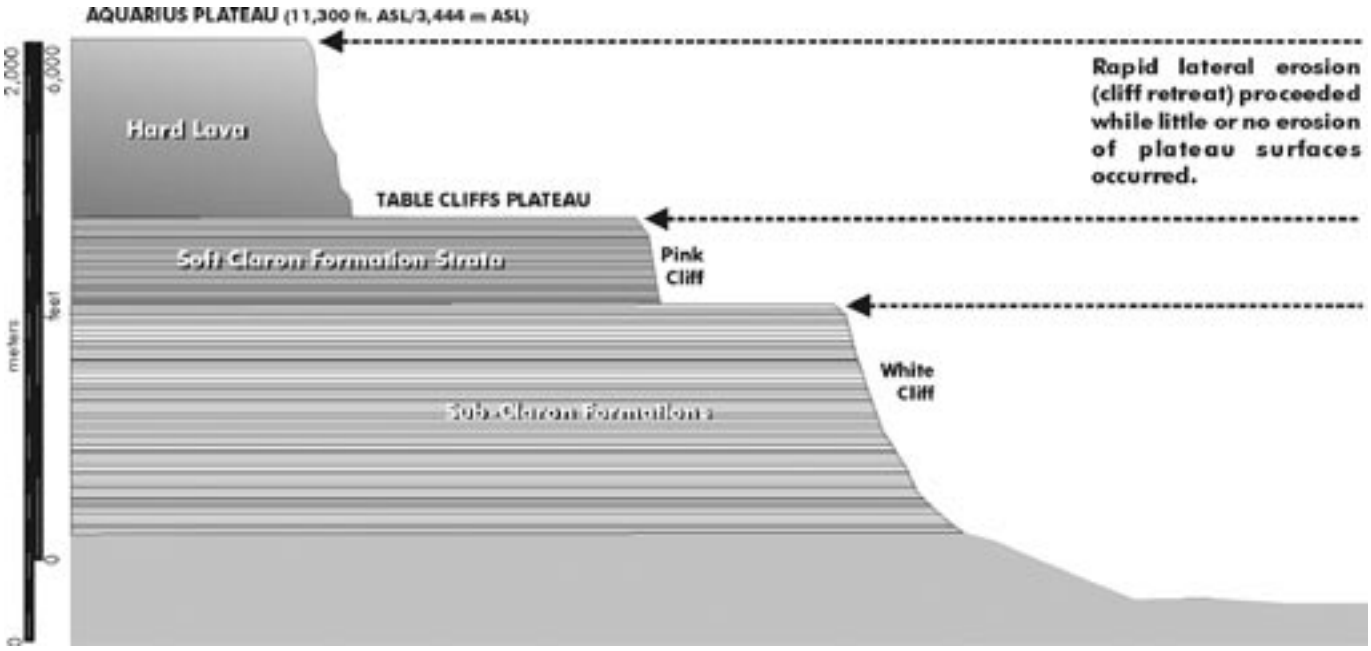

Figure 11. Diagram showing the erosion of the Grand Staircase, south-central Utah. The 2,000 feet (600 m) of lava rocks on top of the Table Cliffs Plateau eroded northward, while the soft Claron Formation underneath hardly eroded downward. The only way this can happen is if the erosion of the lava rocks were rapid, implying that the Grand Staircase was eroded rapidly. Drawn by Peter Klevberg.

within sedimentary rocks but now stands about 6,000 feet (1,829 m) above the surrounding sedimentary rocks, which have eroded away. This erosion must have been rapid, or else Navajo Mountain would not be left standing, since mountains erode much faster than a rolling plateau.

It is interesting to speculate why the Flood sheet currents deeply eroded the area around the Grand Canyon but did not erode as deeply in the area of the Grand Staircase. Could it be that the strata of the Grand Staircase were protected by the hard lavas that capped a wide area, of which the Aquarius Plateau is an erosional remnant? Another possibility is that high north-south mountains in central Nevada and southwest Utah could have caused the Flood currents to flow with less power and erode less to the north. It is probably that a stronger eastward flowing current flowed north of the Grand Staircase to erode the San Rafael Swell. The terrain over southern California and Nevada also could have been lower than the Grand Staircase area and central Nevada, allowing stronger and more erosive Flood currents from the west.

Summary

An average of 8,200 to 16,400 ft (2.5–5.0 km) of erosion occurred on the Colorado Plateau, which includes 6,000 to 10,000 ft (1.83–3.05 km) of erosion in the Grand Canyon area. This amazing episode has been named the Great Denudation by uniformitarian geologists, but they are hard-pressed to explain it. The event was of regional scale, requiring sheets of water flowing at relatively high speeds and transporting the eroded detritus far from the Colorado Plateau. When combined with the completely different erosional event that cut the canyons, a uniformitarian explanation appears impossible. The Great Denudation was caused by east-to-northeast flowing water, as shown by the current direction indicators of the Rim Gravel, which was a depositional lag at the end of the sheet erosion episode. True to their paradigm—even at the expense of the evidence—geologists propose that the event was caused by northeast-flowing streams. But if this were the case, the erosional debris, dated as Tertiary, should be found either on the Colorado Plateau or to the east. It is missing and probably forms part of the continental margin sediments of the Gulf of Mexico.

The scale of the currents required by the Great Denudation and lack of debris on the continent can readily be explained by the sheet-flow phase of the retreating stage of the Genesis Flood (Walker, 1994). Because of earth's rotation, generally west-to-east currents likely would have swept across the western United States when the continent was totally or mostly flooded. The speed could sometimes exceed 100 mph (161 kph) as shown by the work of Baumgardner and Barnette (1994). Such a current easily would be capable of doing the work required by the Great Denudation. Evidence for rapid erosion was shown by the rocks capping the top two stairs of the Grand Staircase just north of Grand Canyon and the existence of Navajo Mountain. The lateral stripping of hard volcanic rocks from the Table Cliffs Plateau with hardly any erosion of the soft Claron formation that caps the plateau, while 4,000 ft (1.22 km) of erosion occurred around the area, can best be explained if erosion was rapid.

Part III of this series proposed that the Grand Canyon was cut late in the Flood, based on geomorphological considerations (Oard, 2010b). Therefore, the Great Denudation would have occurred immediately prior to the canyon-cutting erosional event. This is exactly what is predicted by the two-phase retreat of the Flood from North America. The Great Denudation would have occurred during the sheet-flow phase. After the Great Denudation, the next episode of erosion cut canyons. Again, this is exactly what is expected by the Flood model. Flowing sheets of water would have become channels, steadily decreasing in size as the rising terrain dissected the Floodwater. The erosion of Grand Canyon fits well with the second phase—the channelized-flow phase. The final part of this series will describe how Grand Canyon was carved by that event.

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Notes from the Panorama of Science

Is the Georeactor Hypothesis Plausible?

According to the reigning paradigms of earth science, the earth consists of concentric shells of matter surrounding a nearly spherical object at the center. The mass of the earth was determined from Newton's law of gravitation after Cavendish's laboratory experiments (Cavendish, 1798) on the strength of gravitational forces. The ratio of mass to volume of the earth, 5.5 grams per cubic centimeter, is larger than the density of the rocks of its surface regions by a large margin, too great a difference to be the result of gravitational compression alone. Early in the study of seismology, the data were found to be consistent with a model in which there is a fluid outer core for the earth surrounding a solid inner core, as in Figure 1. Observations of the high density and abundance of iron in meteorites led evolutionary science, in its efforts to explain the origin of the solar system, to the idea of an iron-nickel core for the earth.

In the 1990s, an independent San Diego scientist named J. Marvin Herndon proposed that the solid inner core of the earth and possibly that of some of the other planets contained an actinide subcore of even higher density surrounded by a shell of the products of nuclear fission and radioactive decay. Actinides are a series of chemically similar, radioactive elements with atomic numbers ranging from 89 (actinium) to 103 (lawrencium). Some have short half-lives, and some do not exist in nature. Herndon's model includes a subcore of mostly uranium, thorium, and plutonium of the order of 8 kilometers in diameter, a small fraction of the solid inner core, which is about 2000 kilometers in diameter. In Hollenbach and Herndon (2001), results of calculations performed with Oak Ridge National Laboratory computer codes were presented. They showed that the reactor could maintain self-sustaining chain reactions if initial conditions had been right to enable a fast neutron breeder reactor to be generated over time. Is this idea sound, or is it implausible? What evidence could be examined to support the hypothesis? The idea will be referred to in the remainder of this article as the georeactor hypothesis.

Hollenbach and Herndon's calculations showed that the $^{3}He/^{4}He$ ratios that the georeactor would produce are within the range observed from deep mantle sources. Experimental and theoretical studies of neutron-induced nuclear fission, which is the type involved in chain reactions, indicate that the neutron adds energy, which leads to the deformation of the nucleus. The nucleus then sometimes breaks into two fragments (fission). In a small percentage of the cases, some of the deformation energy is converted into energy needed to separate a third, small particle, a process called ternary fission. Alpha particles (He-4 nuclei) are by far the most abundant light particle emitted in fission, followed by the triton (H-3 nucleus) (Vandenbosch and Huizenga, 1973, p. 378). The triton is an unstable particle, undergoing beta-decay to Helium-3 with a half-life of 12.32 years. However, He-3 has a relatively large probability of absorbing a neutron, becoming He-4, whereas H-3 has only a small probability of absorbing a neutron. Thus, Hollenbach and Herndon calculated that significant quantities of H-3 would diffuse out of the reactor subcore before decaying to He-3. Their simulations showed that the He-3/He-4 ratio produced would be near the value for the earth's atmosphere (1.37×10^{-6}), the exact value depending on the reactor power and actinide concentrations. Thus, if a large fraction of the helium found in the earth's atmosphere is assumed to have originated in the earth's subcore, these data, although not conclusive evidence, are at least consistent with the georeactor hypothesis.

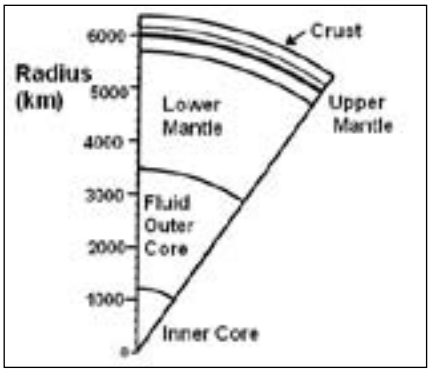

Figure 1. The interior of the earth, showing the onionskin-like modern conceptions of the different subdivisions.

More recently it has become possible to detect neutrinos that originated inside the earth (Araki and the KamLAND collaboration, 2005). Because antineutrinos produced from the 238U and 232Th decay chains have exceedingly small interaction cross sections, they may move through solid rock practically undisturbed in number, and their measurement near the earth's surface can be used to gain information on where they originated. Conventional

geophysical models, which did not assume the existence of a georeactor, predicted that 19 electron antineutrinos would be produced by the decay chains of ^{238}U and ^{232}Th within the earth during a total detector live-time of 749.1 days. KamLAND is primarily a Japan-US collaboration using 100-ton Liquid Scintillator, located in the Kamioka mine, 1,000m below the summit of Mt Ikenoyama, Japan. It is capable of detecting antineutrinos produced by many radioactive nuclei thought to be of significance inside the earth but not Potassium-40, due to the low energy of the antineutrinos in that case. The KamLAND collaboration presented results from a search for geoneutrinos, that is, neutrinos from the earth's interior rather than from the sun or from space. Assuming a Th/U mass concentration ratio of 3.9, the 90% confidence interval for the total number of geoneutrinos detected is 4.5 to 54.2.

A georeactor would continuously produce electron antineutrinos due to the beta-decay of fission products. Because uranium and plutonium have mass numbers greater than that of the fission fragments and have neutron-to-proton mass numbers larger than that of lighter, stable nuclei, the fission fragments are formed with too many neutrons to be stable and will undergo several beta-decays on the way to stability, each beta-decay producing an electron antineutrino. Hence, the 19-electron antineutrino prediction would be increased under a georeactor hypothesis. The fact that the KamLAND data were consistent with as much as 54.2 electron antineutrinos is thus consistent with the georeactor hypothesis, as long as the subcore was small enough and did not operate at too large a power level. It may be that future experiments will be more sensitive and thus will be able to rule out or confirm the georeactor hypothesis. At American Physical Society meetings, a spokesman for KamLAND reported that they were not able to exclude the georeactor possibility (Batygov, 2004; 2005). Nevertheless, the georeactors consistent with the data are only small ones with a low reactor power. Subcores bigger than the 8 kilometers diameter hypothesized by Hollenbach and Herndon (2001), and which were operating as breeder reactors at present, would not be consistent with the data. Also, the data are not consistent with high-power levels for the reactor, which would produce too many antineutrinos.

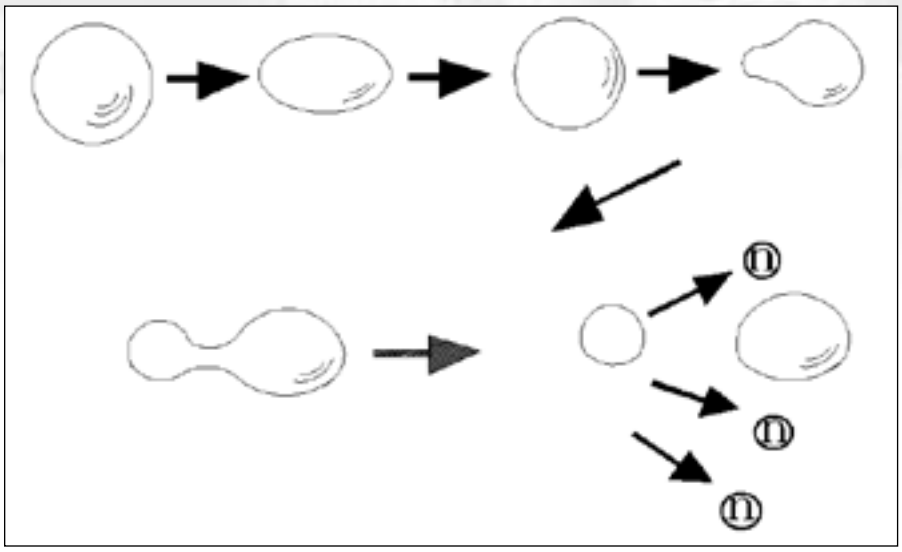

Figure 2. The sequence of events in nuclear fission. The nucleus behaves like an oscillating liquid drop, which can sometimes change to a peanut shape. Since the nuclear force is short-ranged but the electrostatic repulsion is not, the positive charge of the nucleus can cause the peanut shape to split in two, with the emission of neutrons.

Nuclear fission begins when a nucleus deforms. The deformation may be produced when a nucleus absorbs a neutron, resulting in an "excited" nucleus with extra energy, which is called the *compound nucleus*. The situation is often compared to a charged liquid drop. As the drop oscillates, it may assume a peanut shape, which, because of the positive charge on both ends, then splits in two, as in Figure 2. The nuclear force of attraction between nuclear particles is short-ranged; hence, after the drop is split apart, the only force left is the repulsive electrical force, and the two parts must repel each other. The two fragments then emit neutrons and photons. The neutrons may go on to cause more fissions. If the number of neutrons is enough, a self-sustaining chain reaction will result, which we call a nuclear reactor. Reactors usually can be controlled, whereas bombs differ in the rate of assembly of the crucial nuclei and the result is a sudden energy release. One result of all the fission occurring in a reactor is a lot of fission fragments, i.e., smaller nuclei produced when the uranium splits.

Nuclei have properties that depend very much on the exact number of neutrons and protons they contain. In the case of U-238, the formation of the U-239 compound nucleus by the absorption of a neutron causes a change in binding energy of 4.90 MeV, which is less than the critical energy for fission of 5.5 MeV. Hence, thermal neutrons cannot cause fission of U-238. For U-235, the change in binding energy in forming a U-236 compound nucleus is 6.47 MeV, which is more than the critical energy of 5.3 MeV; hence, thermal neutrons can cause fission of U-235.

The critical energy has to do with the minimum energy needed to distort the compound nucleus beyond the point where the short-ranged nuclear forces cannot resist the repulsion of the long-ranged Coulomb forces; hence fission becomes probable.

Hollenbach and Herndon's simulations only allowed an ongoing reactor to exist if it was a breeder reactor. A breeder reactor basically is one that produces more fuel during its operation by packing Uranium-238 around the fissile Uranium-235 or Plutonium-239 in order to absorb neutrons. Unlike the Uranium 235 or Plutonium-239, the predominate result of Uranium-238 absorbing a neutron is not a fission, but what is called a radiative neutron capture. This means that a neutron is absorbed and a photon is emitted, producing Uranium-239. The Uranium-239 then is radioactive, decaying to Neptunium-239, which then decays to Plutonium-239. The reactor thus "breeds" Plutonium-239, a useful reactor fuel.

Chaffin (1984) and Chaffin and Molgaard (2003) studied the Oklo, Gabon, Africa natural reactors and concluded that self-sustaining reactions were at one time occurring and left evidence in the nature of the isotopic distributions left in the ore. However, the Oklo reactors were small. It is interesting that the Hollenbach and Herndon computer simulations indicate the possibility of a large enough reactor continuing in operation via the mechanism of breeding more fuel than it uses.

If there is a nuclear reactor at the core of the earth, it can affect the rate of heat flow coming out of the earth's interior. Thus it would be important in building creationist models of earth history, the earth's magnetic field, and the timescale for dissipating heat from the earth. There are also implications regarding heat flow in other planets in the solar system. Creation science would do well to keep track of developments in this new field.

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Letters to the Editor

The policy of the editorial staff of CRSQ is to allow letters to the editor to express a variety of views. As such, the content of all letters is solely the opinion of the author, and does not necessarily reflect the opinion of the CRSQ editorial staff or the Creation Research Society.

The Origin of the Whale

The whales are divided into two main orders, Mystioceti, or baleen whales, and Odontoceti, or toothed whales. There is a third order into which extinct creatures are put, but whether they were whales or some other form of creature to me is open to question. The name given to these is Archaeoceti.

The oldest known modern whale, according to a private source, is Agorophius of the order Odontoceti, dated at 40 million years old on the evolutionary timescale. The time zone from 40 to 50 million years is perhaps the most important in many ways. From an evolutionary viewpoint, at 65 million years ago, at the end of the dinosaurs, mammals started to spread into many environments. Most of the forerunners of the modern whale are said to come from about 50 million years ago. The whale at 40my must have had a history going back in time, and at least 3my is not an unreasonable supposition, which would of course take it to 43my ago or further, thus we would have covered an area of time that would make the move from land to sea unlikely, to say the least.

However, a dolphin with hind limbs was caught off the coast of Japan in 2006, and experts were quick to point out that this feature made the dolphin look like early dolphin fossils and their ancestors of 40my ago. In 1919 off the coast of Canada a humpback whale was discovered with a pair of hind legs over a metre long, complete with a full set of limb bones (Le Page, 2007, pp. 28-33). These two examples could either be a case of development producing extra limbs in the same way that man can have extra toes or fingers, or this could be an example of the whale and dolphin being created for the water, but with back limbs as well as front ones, having lost the rear set over time. This is nothing new, because there are a number of lizards that have lost their limbs and now look snakelike in their appearance.

However, let us look for a moment at what prospects there are for producing a basic whale from a land creature, because if this were possible our options as creationists with respect to the whale would be far greater and would silence evolutionists on this subject altogether! If we are comfortable with seals originating on land, producing many inches of blubber, and having limbs transformed into flippers, then we have only to take this a little further and we could have the dugong (*Dugong dugong*), which does not have any hind limbs but *does* have a tail fluke like the whale. From here we only need to have the head become elongated, and there is nothing wrong with this in creation, for things can get larger/smaller/fatter/thinner etc. in creation; no laws are broken by this. Nasal openings then move from the snout to the top of the head, and we have our first basic whale, from which subsequent changes could arise. There is a creature in the fossil record with nasal openings about midway between snout and the top of the head, namely the Basilosaur (Young, 1975, p.675).

This could possibly happen because the kind, to me, is a plan that includes both what we can see, i.e. the phenotype, and what I call the life-form's genetic potential. This is the amount of genetic change possible, taken from any given point in time into the future.

Myoglobin in the whale contains 153 amino acids, and amino acids come in 20 forms, so 20 to the power of 153 gives us something like a figure of 10 followed by about 200 zeros, this being far more than all the proteins in all the whales, plus all the animals and plants that have ever lived (Jones, 1999, p.75). So, whilst I would favour the creation of whales and dolphins already designed for an aquatic existence, I would be just as happy if they were shown to have originated as land dwellers; either way creation still wins the day without any problem at all.

With the discovery of fossil tetrapod footprints at 397my old, putting them well before the main lines of lobe-finned fishes, we now know for certain life has *not* evolved (Brown, 2010, p.314).

So, the options for the origin of the whale in this paper carries no evolution whatever, only creation.

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"Demise of Dinosaurs" Revolutionary

I really enjoyed reading the article entitled "Genesis and the Demise of the Dinosaurs" by Joel D. Klenck (*Creation Research Society Quarterly* 46). The well-reasoned article made so much sense in light of plant and animal fossils. I have really struggled with the notion that all Paleozoic, Mesozoic, and Cenozoic strata were formed just by the Flood.

Until this article, the variety of explanations like floating log mats, T.A.B., and heavier-bones-sink-to-the bottom, stretched the lines of credibility. The argument that all these strata are from one Flood event confronts serious obstacles:

1. Paleosols with layers of dry, parched, cracked earth in the middle of Paleozoic and Mesozoic strata. How does dry cracked earth form in the middle of a global Flood?

2. Successive layers of animals and plants, with roots and rhizoids, showing that they were growing in the deposited locales. How do multiple layers of plants grow during the world's biggest catastrophe?

3. The spread of mammals over strata with amphibians and dinosaurs.

You would expect at least one plucky hadrosaur to be able to play "king of the mountain" quite effectively against a bunch of mammals. Yet dinosaurs are routinely found in strata under layers with mammal bones.

Klenck's article shows Biblical support for local/regional disasters that destroyed most dinosaurs before the worldwide Flood. For me, the article was revolutionary.

Also, who are Gentet and Watt? Before Klenck's article, I had never heard of these individuals. Why are there not more articles featured by the "minority" view? This should be the majority view.

I am glad to see *CRSQ* offering a variety of articles like Klenck's. It speaks highly of the editorial staff at *CRSQ*.

Kind Regards,
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Biblical Evidence for Demise of the Dinosaurs

I must say I was pleasantly surprised by Joel Klenck's article (*Creation Research Society Quarterly* 46). Having dabbled in archaeology, I have questioned why many emphatically insist that dinosaurs lived with humans despite that not one living dinosaur has ever been found. Plus, we have not found any dinosaur bones in any archaeology digs. Also, no dinosaur bones have been found with human remains. Klenck's article provides a Biblical answer in that these animals mostly died out as a result of the curse after the Fall.

This article really challenges an idea, accepted by many in our community, that at one time children played with dinosaurs. I wonder how long "playtime" would last with a *Velociraptor*, especially if, as Klenck notes, a serpent was able to be possessed by Satan?

I am interested to hear if he has a Biblical argument for the distribution of dinosaur remains throughout the earth. It is one thing to show the dinosaurs (and potentially other animals) died before the Flood, which corresponds to the fossil data; it is another to explain their dispersion throughout the earth. I know this is outside the subject of his article, but I wonder if Klenck can comment on this.

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No Evidence for Pre-Flood Demise of the Dinosaurs

The stated thesis of this paper [Joel Klinck's "Genesis and the Demise of the Dinosaurs," *Creation Research Society Quarterly* 46] is that the number of dinosaurs alive at various periods of biblical history varied directly as the number of textual references to these animals. The author's entire analysis and conclusions teeter on this assumption, which can be shown to be deeply flawed.

The Bible is not a scholarly treatise on abundance of fauna, and there is no statement anywhere in it as to the number of specific animals alive at any given time. There could be many reasons for scriptural mention, or lack of mention, of a given animal group. The Bible focuses on God's dealings with man, after all, not with animals.

Before the Fall, the number of animals in existence would have been determined by how many God had just created and how much time (if any) they had had to reproduce.

Indeed, it is highly possible that God originally created only two of each kind, which means that there may have been a very small number of each kind of animal in existence, including both tame and wild, in the Garden before the Fall. After the Fall, whether before or after the Flood (depending on one's chosen Flood model), there were a *great* many more dinosaurs (included in the category of beasts of the earth/field) than could possibly have been living in the Garden before the Fall; this is obvious from the vast numbers of dinosaur fossils that we now find around the world. This directly refutes the author's thesis that the number of scriptural mentions varies directly as the number of beasts of the earth/field; there are seven mentions before the Fall, when there were few of these dinosaurs in existence, and a total of only six mentions later on, when we know that there were huge numbers of these animals.

The author calls the seven pre-Fall mentions "much mention of the beasts of the earth and field." It is hard to see how seven constitutes "much mention"; seven unrelated mentions of the wild beasts of the earth is way below the number that is required for any kind of statistical reliability, as any statistician would point out. The same argument from statistics applies to the mere three mentions each of these beasts of the field between the Fall and the Flood and then three again between the Flood and Joshua. In any case, the seven mentions before the Fall are not unrelated, which lowers their statistical reliability even more. This is because the literary style of the first chapters of Genesis includes some repeating of the Creation story, and therefore there is repetition in mentions of wild beasts of the field because of how the story is being told.

In order to make the dinosaurs disappear before the Flood, it is necessary to explain the thousands of feet of sediments those dinosaur fossils sit atop. The author says the sediments could have easily been laid before the Flood began because after the Fall the ground was cursed. This would have necessitated major geological forces acting on the earth before the beginning of the Flood, and there is certainly no hint of this in Scripture. If this author is going to give priority to Scripture mentions, then his hypothesis about those deep pre-Flood sediments falls down right there. He can't have this both ways.

Those (like the author of this paper) who push the idea that there was a great physical decline before the Flood are on shaky ground. People continued to live long lives right up to the Flood, as we know from the genealogies of Genesis (Noah lived longer than Adam). All the verses quoted by the author to support his thesis of animals going extinct before the Flood can be interpreted in other ways; e.g., the corruption of Genesis 6:11–13 is associated with violence in the same verse and would appear to have been a moral corruption, not a physical one. Furthermore, the context of the whole chapter indicates that it was the behavior of man, not animals, that concerned God (since animals do not have morals), and it was the stated wickedness of *man* that caused God to destroy the earth by Flood (Gen. 6:5).

One might wonder whether we could pick out other things in the Bible and judge their relative numbers by the number of mentions. Women? They aren't mentioned in the genealogies at all, but presumably they were there in equal numbers. If we carry the author's thesis to its ultimate end, where do we stop?

Incidentally, the author is incorrect when he says on p.165 that Genesis 9:3–4 shows that carnivory began after the Fall. These verses are spoken by God after the Flood, not after the Fall, and it could be argued that carnivory had not taken place before that because there is no mention of it (there is that word "mention" again).

The author misses one possibility on p.165 when he says that God's curse on the serpent either applied to only this one serpent or to all the beasts of the field or earth. It cannot have been the latter, because in Genesis 3:14 God says that the serpent was to be cursed above all the cattle and above all the beasts of the field. Clearly, the curse was specifically on the serpent and not the other animals. A third possibility, not mentioned by the author, is more likely; since serpents still move on their bellies, it would seem likely that the curse was on the serpent's seed as well as on the original serpent. This is further underlined by the reference to the serpent's seed in Genesis 3:15.

There are some other ideas in this paper that really are a stretch, as, for instance, the matter of these wild beasts

of the earth being more easily inhabited by evil spirits than other animals. The serpent in the Garden of Eden would seem to be a special case, and does not prove anything; it is hard to see why this particular ability to be inhabited by demons should be extended to all the other beasts of the field. This is particularly true because it was the serpent that was cursed, not the other animals.

In conclusion, this paper does not appear to present any valid evidence that the dinosaurs nearly died out before the Flood.

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The Demise of the Dinosaurs before the Flood: Biblical and Paleontological Correlations (response)

There are two realities with the demise of the dinosaurs: Biblical references and the observed phenomena in paleontological studies. After the Fall, God cursed the serpent (Genesis 3:1–15). Subsequently, the mention of two large groups of animals so verdant during Creation sharply declines, and there is no record of them embarking on or debarking off the ark (Table I). In paleontological studies, dinosaurs and dinosaur-like animals, in strata associated with the Paleozoic and Mesozoic, were destroyed throughout the earth. After their destruction, snakes, crocodile-like animals, and mammals spread throughout the world and are found in layers above those of the dinosaurs.

First, the Biblical accounts show a more prominent mention of the *chayat ha'aretz* (beast of the earth) and *chayat ha'sadeh* (beast of the field) compared to the mention of *behemah* (sometimes translated "cattle") in the first three chapters of Genesis (Klenck 2009, 2010a, 2010b). These references cite Scripture such as Leviticus 11, Deuteronomy 14, and other verses where God equates *behemah* with medium-to-large sized mammals, and *chayat ha'sadeh* are associated with *nachash* (serpent, Genesis 3:1) and *tannin* (dragon; Isaiah 43:20). We also know from the Bible that *nachash* and *tannin* refer to snakes, crocodile-like animals, and very big, dinosaur-like animals (e.g., *nachash* denoting snakes [Genesis 49:17; Psalm 140:3; Isaiah 14:29], aquatic, dinosaur-like serpents [Isaiah 27:1; Job 41]; *tannin* denoting crocodiles [Ezekiel 29:3; 32:2], snakes [Exodus 7:9–10, 12; Deuteronomy 32:33; Psalm 91:13], terrestrial dinosaur-like dragons [Isaiah 35:7; Jeremiah 9:11; 10:22; 49:33; 51:37], aquatic dinosaur-like serpents [Isaiah 27:1; Job 41]). Furthermore, during Creation *chayat ha'aretz* (beast of the earth) and *chayat ha'sadeh* (beast of the field) are mentioned to a much greater degree than *behemah* (sometimes translated "cattle") before the Fall.

However, after the Fall and before the Flood, something remarkable occurs: The mention of *chayat ha'aretz* and *chayat ha'sadeh* drop dramatically compared to the proportional increase in the mention of *behemah* (medium-to-large sized mammals). After the Flood, this proportional disparity in favor of *behemah* increases further. In addition,

Table I. A numerical comparison of verses, from Genesis through Deuteronomy, referencing *behemah*, beasts of the earth, and beasts of the field.

Books in the Bible	*Behemah*	*% Behemah*	Beasts of the Earth and Field	% Beasts of the Earth and Field
From creation to the fall (Genesis 1:1–3:24)	5	41.7%	7	58.3%
After the fall and throughout the flood (Genesis 4:1-9:29)	13	81.3%	3	18.8%
After the flood to Joshua (Genesis 10:1–Deuteronomy)	85	96.6%	3	3.4%

the Flood account is also remarkable because God and Noah do not mention either the beasts of the earth or beasts of the field getting on or off the ark (Genesis 6:7, 18–20; 7:2–3, 7–8, 13–14, 21, 23; 8:16–19). Conversely, all other terrestrial groups of animals mentioned at creation—*remes* or *sheretz* (creepers and swarmers including insects, snails, lizards, amphibians, and small mammals); *ohf* (birds and bats); *behemah* (medium-to-large-sized mammals)—are all noted repeatedly embarking on and debarking off the ark. It is clear from references in the Bible that some *tannin* dragons survived the Flood. However, that neither God nor Noah mentions the beasts of the earth / field embarking on or debarking off the ark suggests that during the Flood, these groups were so diminished in numbers that they are not considered by God or Noah as noteworthy animal groups.

With this observation of Biblical verses is the analysis of the Biblical Hebrew involving the curse of the *nachash* or serpent in Genesis 3:14–15. God curses the serpent using future-tense verbs: "on your belly you shall go" and "you shall eat dust." Obviously, if the serpent was already a snake, the curse would be a nonevent since it would already be crawling and licking the dust. However, when we consider that *nachash* can refer to snakes, crocodile-like animals, and fauna resembling dinosaurs, the curse becomes ominous as the dinosaur-like serpents would all fall squarely in the scope of the curse since they were neither licking the dust nor crawling on the ground, unlike snakes or *Crocodilia*. Furthermore, that God was not cursing only the individual serpent is clear from the Biblical context. Although God cursed the serpent, Eve, and Adam, using verbs pertaining only to the individual, His judgments—pain in child birth, hard labor, and death—clearly applied to all men and women after Adam and Eve (Genesis 3:16–19). Similarly, the curse of the serpent did not apply only to the individual serpent. Indeed, the mention of a future descendant of Eve crushing the serpent's head and the serpent having seed clearly indicates that the curse applied to multiple serpents (Genesis 3:15).

Second, there are the observations in paleontological analyses. Dinosaurs or dinosaur-like animals died *en-masse* throughout the world during the early history of the earth. The stratigraphy or layers, where the remains of dinosaurs or dinosaur-like animals are found, are superimposed by strata that comprise mammals (see Benton 1986, 1991, 1994; Balme, 1970; Olsen and Sues, 1986; Fowell and Olsen, 1993; MacLeod and Keller, 1996; Hallam, 1989; Glen, 1994; Sharpton and Ward, 1990; Padian and Clemens 1985). To reiterate in paleontological terms, dinosaur-like animals or dinosaurs such as *Scutosaurus*, *Dimetrodon*, *Moschops*, and *Pelanomodon* associated with Paleozoic strata; and *Euparkeria*, *Ornithosuchus*, and *Postosuchus*, and *Effigia* and other dinosaurs or dinosaur-like animals attributed to Mesozoic strata are superimposed or covered over by layers with mammals such as *Plesiadapis*, *Uintaterium*, and *Hyaenodon* that are associated with the Cenozoic.

For most creationists, the Paleozoic, Mesozoic, and Cenozoic are not time periods but gardens, biogeographical or ecological zones, biomes, or ecosystems that existed at the same time at the advent of Creation (Klenck 2010c; Wise, 2004, 2002; Gentet, 2000; Scheven, 1996; Woodmorappe, 1983; Clark, 1977, 1971, 1968). It is noteworthy then that in Paleozoic and Mesozoic biomes, all three versions of *nachash* and *tannin* are found: snake-like animals, crocodile-like animals, and dinosaur-like fauna. For example, in the Paleozoic paleontologists have retrieved snake-like animals such as *Phlegethontia*, animals similar to crocodiles such as *Mesosaurus*, and the aforementioned fauna similar to dinosaurs. In the Mesozoic strata, paleontologists have retrieved snakes such as *Sanajeh indicus*, crocodile-like animals like *Parasuchus*, and much dinosaur remains.

However, in strata that is associated with the Cenozoic, dinosaur-like animals are arguably not found anywhere in the world. There is the controversial site of Hell Creek, Montana, where paleontologists fiercely debate whether there were dinosaurs in the lower levels of the Cenozoic (Sheehan et al., 1991; Archibald and Bryant, 1990; Sheehan and Fastovsky, 1992; Hurlbert and Archibald, 1995). There are also the controversial citations of Watson (2001) about dinosaurs found in Flood strata associated with phosphate deposits in South Carolina. However, most paleontologists would agree that Cenozoic assemblages contain only snakes like the Titanoboa, crocodiles and alligators, and much mammalian fauna.

To sum, the Genesis report of the Fall notes the curse of the serpent (Genesis 3:14–15), the curse of the ground (Genesis 3:17), and that all *nachash* would in the future crawl on the ground and eat dust (Genesis 3:14). The beasts of the earth and field sharply decline in mention after the Fall (and before the Flood) as opposed to mammals, which increase in mention during this time. Beasts of the earth / field are also not mentioned embarking on or debarking off the ark, unlike every other group at Creation, especially *behemah* or mammals. These Biblical references correlate with paleontological data and the extinction of dinosaurs or dinosaur-like animals throughout the world. The totality of scriptural references also associate with other observed phenomena: The survival of only snakes and crocodile-like animals into the present day, the increase in mammals, and that mammal-laden layers cover strata containing dinosaur remains.

For Jameson and Hammond, who have some experience in archaeology and paleontology, the correlations are

readily evident and thought provoking. Habermehl, however, presents a variety of comments and questions.

Habermehl states that the Bible is "not a scholarly treatise." I would argue the Bible represents the inerrant word of God. Every word is important, truthful, and scholarly. The Bible is the ultimate scholarly treatise. As such, every mention or lack of mention of animals or groups of animals should be treated with great respect and gravity. Habermehl comments that the Bible does not focus on "God's dealings … with animals." This comment is flawed, as God not only names the plants and animal groups at Creation (Genesis 1–3) but then also, in the first person, He ascribes clean and unclean kinds to each animal group (Leviticus 11; Deuteronomy 14).

Habermehl asserts that only one pair of each animal kind was created—the same as Adam and Eve. This comment dismisses the Biblical context. During Creation, the Biblical Hebrew is clear that God created populations of animal kinds; however, when it came to man, God first created only Adam (Genesis 2:7, 15–20). This dichotomy is also seen in the paleontological record, where in the early earth, animal kinds are represented in abundance, while the evidence for early humans is extremely sparse in the earliest paleoanthropological contexts.

Habermehl questions the statistical validity of the proportional decrease of mentions of the beasts of the earth and field and increase in mentions of *behemah* (medium-to-large mammals). Provided are chi-square statistics showing that the trends are statistically significant at an alpha-level of .05. The statistical analysis indicates that the trends are not random and suggests they were purposefully placed in Genesis (Table 2).

This statistically significant trend coincides with the fact that neither God nor Moses mentions putting the beasts of the earth or field on the ark despite the fact that every other major terrestrial animal group at creation is placed on the vessel (e.g., creepers/swarmers; birds; and mammals). The curse of the serpent, curse of the ground, lack of mention of beasts of the earth / field getting on or off the ark, and sharp statistically significant decline in mention of these latter groups after the Fall and before the Flood indicate that the demise of *Dinosauria* and dinosaur-like animals occurred during this time.

With these Biblical references and trends are the paleontological data evidencing that dinosaurs and dinosaur-like animals were destroyed and buried by regional disasters caused by volcanism, comet and meteor impacts, the draining of inland lakes, anoxic oceans, and local tsunamis (Raup 1979; Hoffman 1986; McKinney 1995; Allison and Briggs 1993; Benton 1995; Alvarez et al., 1980; Courtillot 1990; Hallam, 1992; Southham et al., 1982). These destructions largely avoided areas where mammals and flowering plants flourished (Klenck 2010d). Not surprisingly, these regional events were followed by the spread of mammals throughout the earth. Later, worldwide destruction occurred, resulting in the severe attrition of mammalian and other fauna in the Late Cenozoic (Martin 1984a; 1984b; Webb and Barnosky, 1989). Hence, we have an excellent correlation between the Bible and paleontology concerning the destruction and deposition of the dinosaurs after the Fall and before the Flood.

Next, Habermehl questions whether the curse of the serpent, curse of the ground, statistically significant proportional decrease in the mention of the beasts of the field / earth, and God and Moses not mentioning these animals getting on or off the ark merely shows "moral corruption" and not a "physical" curse. This notion is untenable. God even states that the serpent and its related kinds would crawl on the ground and eat the dust of the earth (Genesis 3:14–15). All these Biblical references point to the curses in the Fall being physical and devastating—as one would expect from a curse from God.

Habermehl then joins two events, the Fall (Genesis 3) and the Flood, by citing the "wickedness of man" (Genesis 6:5). This relates to the Flood, not the Fall. Adam and Eve ate of the forbidden fruit but were not doing or thinking only evil all day long, unlike human populations just before the Flood (Genesis 6).

Habermehl questions whether the lack of mention of women challenges my thesis. This critique is suspect. Throughout Genesis 5, the lineage of Adam constantly refers to daughters being born to each descendant (Genesis 5:2, 4, 7, 10, 13, 16, 19, 22, 26, 30). Also, the Bible mentions that Noah's wife and the wives of his three sons embarked on and debarked off the ark (Genesis 6:18; 7:1, 7, 13, 23; 8:16, 18). These scriptural mentions evidence women being equally represented in the period between the Fall and Flood. This frequent report of women and daughters before and during the Deluge contrasts the fact that neither God nor Moses mentions the beast of the earth or field getting on or coming off the ark.

Habermehl argues that carnivory did not take place before the Flood. However, even flood geologists cite that Paleozoic and Mesozoic strata could, in part, be pre-Flood. Creationist and secular paleontological research cite bite marks and small animals in the stomachs of larger fauna evidencing that carnivory was very prevalent before the Flood (Woodmorappe, 2001; Carpenter, 1998; Hu et al., 2005). Habermehl's statement on carnivory does not incorporate secular and creationist research to the contrary.

Habermehl discounts that the beasts of the field comprised snakes, crocodile-like animals, and fauna resembling dinosaurs. That God cursed the serpent in the garden, who was not crawling on the ground or licking the dust, and cursed this animal above all other beasts

Table II. Statistical evaluation of mentions of beasts of field and earth compared to medium-to-large mammals or "*behemah*."

Expected Value	*Behemah*	Beasts of E/F	Total	Chi Square Stat	*Behemah*	Beasts of E/F
Creation to Fall	7.714	4.286	12	Creation to Fall	0.955	1.719
Post-Fall to Flood	10.286	5.714	16	Post-Fall to Flood	0.716	1.289
Total	18	10	28			
Actual Value	***Behemah***	**Beasts of E/F**	**Total**	Chi Sqr Stat	4.680	
Creation to Fall	5	7	12	Degrees Freedom	1	
Post-Fall to Flood	13	3	16	P < .05 Chi Sqr Stat (Df=1)	3.841	
Total	18	10	28	Result	Statistically Significant	
Expected Value	***Behemah***	**Beasts of E/F**	**Total**	**Chi Square Stat**	***Behemah***	**Beasts of E/F**
Creation to Fall	10.655	1.345	12	Creation to Fall	3.001	23.781
Post-Fall to Flood	14.207	1.793	16	Post-Fall to Flood	0.103	0.812
Post-Flood through Deut.	78.138	9.862	88	Post-Flood through Deut.	0.603	4.775
Total	103	13	116			
Actual Value	***Behemah***	**Beasts of E/F**	**Total**	Chi Sqr Stat	33.074	
Creation to Fall	5	7	12	Degrees Freedom	2	
Post-Fall to Flood	13	3	16	P < .05 Chi Sqr Stat (Df=1)	5.991	
Post-Flood through Deut.	85	3	88	Result	Statistically Significant	
Total	103	13	116			

of the field, puts the target of God's wrath squarely on a dinosaur-like animal. That God's curse extended beyond only one woman and one man, suggests that God's curse of the serpent extended to serpents not licking the dust or crawling on the ground—dinosaurs and dinosaur-like animals.

Habermehl critiques the spiritual aspects of my thesis, which is odd given that this is a creation research journal. When demons were sent into pigs, belonging to the *behemah*, they committed mass suicide (Mark 5:8–13). When Satan possessed the serpent, a beast of the field or *chayat ha'sadeh*, the abilities of this animal was augmented as it proceeded to tempt Eve (Genesis 3:1–5). These are Biblical citations, not speculation. If Habermehl objects to the possession of the serpent and its implications for the possession of other serpents, she must address these concerns with the Bible, which again exhibits "God's dealings … with animals."

I appreciate the comments by Jameson and Hammond. As each is familiar with creationist and secular paleontological analyses, their remarks are cogent and noteworthy. Jameson and Hammond represent the growing numbers in the creationist community that doubt the idea that the Flood caused all geological stratigraphy. Jameson correctly notes that no dinosaur remains are found in any human archaeological context throughout the world. This observed fact contradicts insistent claims that there was regular interaction between humans (even children) and dinosaurs. Furthermore, Hammond cogently remarks that paleontological

studies indicate layers of different types of animals and plants; multiple strata of dried-out soil; and that layers with dinosaur remains are regularly found under those containing mammal bones. These observations contradict the view that Paleozoic, Mesozoic, and most Cenozoic strata were only formed during the Flood.

To sum, I believe that hypotheses that incorporate all related Biblical references and provide the best explanations for the breadth of observed data will—although it may take time—prevail over dogmatic assertions.

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Beware the "Best-in-Field" Fallacy

There is a particularly slippery fallacy that creationists must beware because (1) it is a favorite canard of evolutionists and (2) it has, unfortunately, begun to appear in some creationist writings. It is what MacBeth defined as the "best-in-field" fallacy, and it is commonly used in the role of illegitimately deflecting criticism. In its most basic form, it states: You cannot criticize my idea until you have proposed a superior alternative.

MacBeth stated, "The best-in-field fallacy seems to be my own discovery. It does not appear in books on fallacies and I have not seen it clearly expressed anywhere else" (MacBeth, 1971, p. 78). He goes on to state in a footnote: "Gray … Haldane … and Kuhn … all seem to have perceived the best-in-field fallacy, though they have not formulated it clearly" (pp. 80–81). He illustrates its logical flaw when he states, "But when the others are no good, this [being the best theory] is faint praise. Is there any glory in outrunning a cripple in a foot race?" (p. 77, brackets added). He deduced the fallacy from seeing it used by evolutionists: "It appears with unusual frequency among the evolutionary theorists, who seem to have a special weakness for it" (p. 78).

As MacBeth noted, this approach leaves us measuring truth, not by logic and empirical data, but by an appeal to the power of explanation. At its root, this fallacy is relativistic:

> It seems that the standards of the evolutionary theorists are relative or comparative rather than absolute. If such a theorist makes a suggestion that is better than other suggestions, or better than nothing, he feels that he has accomplished something even if his suggestion will obviously not hold water. He does not believe he must meet any objective standards of logic, reason, or probability (MacBeth, 1971, p. 78).

When truth is measured by "explanatory value" rather than by a correspondence to reality, determined by empirical and logical tests, we find ourselves far from our moorings. No creationist should equate truth with the ability to spin a complex story with "explanatory value," especially in the face of historical uncertainty. When the most honest answer is "I don't know," we should have the courage to say so, with appropriate humility.

The best-in-field fallacy crops up in the arena of natural history. It is nourished by the mistaken view that reconstructions of natural history inherently possess the certainty of science (Reed, 2002; 2003; Reed et al., 2004). Henry (2002, p. 217) noted its use in the field of stellar evolution:

> The implication of this assessment seems to be that creationists ought not to reject evolutionary concepts such as stellar evolution without first developing a "better" concept of their own as a substitute. This claim, sometimes called the "best-in-

> field" fallacy … maintains in effect that one is not justified in rejecting falsehood until a theory of elegance equal to the false position has been devised.

But it is a down-to-earth fallacy too. Advocates of evolution, uniformitarian geology, and plate tectonics are all quick to shelter beneath its wings—countless claims have been made that the truth of these scenarios should be accepted merely because they are the "best" theory available. Sadly, the fallacy has even taken root in creationist writings. We have seen it applied in two specific situations.

The first has been to beat back criticism of catastrophic plate tectonics (CPT). A recent defense of that model noted that "they and the others [critics of CPT] have not yet offered *any viable alternative* (Dickens and Snelling, 2008, p. 48, brackets and emphasis added). This reflects a similar statement by another CPT proponent:

> Indeed, if the plate tectonics paradigm is as defective as he would have us believe, then it should not be that difficult for him to provide a positive alternative. And if he had such an alternative, he would surely be focusing more of his attention on its superior explanatory power. But … does not have any serious alternative (Baumgardner, 2002, p. 78).

Just as MacBeth noted, the fallacy occurs when the argument shifts from empirical and logical defects in the model to the failure of the critic to provide a superior alternative. Anyone who retreats behind the best-in-field fallacy fails to understand that the burden of proof is always on those making assertions, not their critics. The failure of a critic to provide a superior alternative is irrelevant, since propositions made by any model are either true or false, as determined by their ability to meet empirical and logical tests. It is the task of critics to test those propositions by these tests, independently of building competing models.

The second incidence of the best-in-field fallacy has been its use as a shield against critics of the chronostratigraphy of the geologic timescale.

> Indeed, it is all too easy for them to be critical of us accepting that these literal rock units are found in sequences that may be walked over in the field, *but as far as we are aware they have yet to make any attempt to provide an alternate explanation for how these mappable sequences may be understood within a young-earth creationist framework* (Dickens and Snelling, 2008, p. 48, emphasis added).

Explanation is a worthy goal for creationists, but it must remain in the context of the pursuit of truth. There has been a rush to build "Flood models" in recent years, which is surprising, given the limited foundational work of reinterpreting secular research, which interweaves data with assumptions and methods not necessarily acceptable to the Christian worldview. We have no issue with creationists who wish to build models, but they must recognize that when they do so, other creationists can and should criticize those models by subjecting their propositions to appropriate truth tests. Negative criticism in that sense cannot be brushed aside by the false claim that such criticism is invalid because the individual making it has not proposed a counter-model. That is the essence of the best-in-field fallacy.

When the mere possession of an "explanation" displaces truth as our raison d'être, knowledge can only suffer. It is the calling of some to develop models; part of that calling is to accept the full and fair criticism by which these ideas are subjected to truth tests. So with a view to truth instead of explanatory power, we must reject the best-in-field fallacy and engage in a full and rigorous exchange of ideas in a professional and Christian atmosphere.

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Author and Title INDEX for Volume 46, 2009–2010

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This title/author index covers articles, panorama notes and other features. For items with two or more pages, the reference is to the first page only. After the page number, a letter indicates which type of entry is involved: article (A), panorama note (P), letter to the editor (L), book or video review (R), cover photo (CP), or other departments (such as editorials, laboratory director's comments, president's remarks, photo essays, etc.) (D).

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The *Quarterly* is a journal of original writings, and only under unusual circumstances will previously published material be reprinted. Questions regarding this should be submitted to the Editor (CRSQeditor@creationresearch.org) prior to submitting any previously published material. In addition, manuscripts submitted to the *Quarterly* should not be concurrently submitted to another journal. Violation of this will result in immediate rejection of the submitted manuscript. Also, if an author uses copyrighted photographs or other material, a release from the copyright holder should be submitted.

Appearance

Manuscripts shall be computer-printed or neatly typed. Lines should be double-spaced, including figure legends, table footnotes, and references. All pages should be sequentially numbered. Upon acceptance of the manuscript for publication, an electronic version is requested (Word, WordPerfect, or Rich Text Format), with the graphics in separate electronic files. However, if submission of an electronic final version is not possible for the author, then a cleanly printed or typed copy is acceptable.

Submitted manuscripts should have the following organizational format:

1. Title page. This page should contain the title of the manuscript, the author's name, and all relevant contact information (including mailing address, telephone number, fax number, and e-mail address). If the manuscript is submitted by multiple authors, one author should serve as the corresponding author, and this should be noted on the title page.

2. Abstract page. This is page 1 of the manuscript, and should contain the article title at the top, followed by the abstract for the article. Abstracts should be between 75 and 200 words in length and present an overview of the material discussed in the article, including all major conclusions. Use of abbreviations and references in the abstract should be avoided. This page should also contain at least five key words appropriate for identifying this article via a computer search.

3. Introduction. The introduction should provide sufficient background information to allow the reader to understand the relevance and significance of the article for creation science.

4. Body of the text. Two types of headings are typically used by the *CRSQ*. A major heading consists of a large font bold print that is centered in column, and is used for each major change of focus or topic. A minor heading consists of a regular font bold print that is flush to the left margin, and is used following a major heading and helps to organize points within each major topic. Do not split words with hyphens, or use all capital letters for any words. Also, do not use bold type, except for headings (italics can be occasionally used to draw distinction to specific words). Italics should not be used for foreign words in common usage, e.g., "et al.", "ibid.", "ca." and "ad infinitum." Previously published literature should be cited using the author's last name(s) and the year of publication (ex. Smith, 2003; Smith and Jones, 2003). If the citation has more than two authors, only the first author's name should appear (ex. Smith et al., 2003). Contributing authors should examine this issue of the *CRSQ* or consult the Society's web site for specific examples as well as a more detailed explanation of

manuscript preparation. Frequently-used terms can be abbreviated by placing abbreviations in parentheses following the first usage of the term in the text, for example, polyacrylamide gel electrophoresis (PAGE) or catastrophic plate tectonics (CPT). Only the abbreviation need be used afterward. If numerous abbreviations are used, authors should consider providing a list of abbreviations. Also, because of the variable usage of the terms "microevolution" and "macroevolution," authors should clearly define how they are specifically using these terms. Use of the term "creationism" should be avoided. All figures and tables should be cited in the body of the text, and be numbered in the sequential order that they appear in the text (figures and tables are numbered separately with Arabic and Roman numerals, respectively).

5. Summary. A summary paragraph(s) is often useful for readers. The summary should provide the reader an overview of the material just presented, and often helps the reader to summarize the salient points and conclusions the author has made throughout the text.

6. References. Authors should take extra measures to be certain that all references cited within the text are documented in the reference section. These references should be formatted in the current *CRSQ* style. (When the *Quarterly* appears in the references multiple times, then an abbreviation to *CRSQ* is acceptable.) The examples below cover the most common types of references:

Robinson, D.A., and D.P. Cavanaugh. 1998. A quantitative approach to baraminology with examples from the catarrhine primates. *CRSQ* 34:196–208.

Lipman, E.A., B. Schuler, O. Bakajin, and W.A. Eaton. 2003. Single-molecule measurement of protein folding kinetics. *Science* 301:1233–1235.

Margulis, L. 1971a. The origin of plant and animal cells. *American Scientific* 59:230–235.

Margulis, L. 1971b. *Origin of Eukaryotic Cells*. Yale University Press, New Haven, CT.

Hitchcock, A.S. 1971. *Manual of Grasses of the United States*. Dover Publications, New York, NY.

Walker, T.B. 1994. A Biblical geologic model. In Walsh, R.E. (editor), *Proceedings of the Third International Conference on Creationism* (technical symposium sessions), pp. 581–592. Creation Science Fellowship, Pittsburgh, PA.

7. Tables. All tables cited in the text should be individually placed in numerical order following the reference section, and not embedded in the text. Each table should have a header statement that serves as a title for that table (see a current issue of the *Quarterly* for specific examples). Use tabs, rather than multiple spaces, in aligning columns within a table. Tables should be composed with *14-point type* to insure proper appearance in the columns of the *CRSQ*.

8. Figures. All figures cited in the text should be individually placed in numerical order, and placed after the tables. Do not embed figures in the text. Each figure should contain a legend that provides sufficient description to enable the reader to understand the basic concepts of the figure without needing to refer to the text. Legends should be on a separate page from the figure. All figures and drawings should be of high quality (hand-drawn illustrations and lettering should be professionally done). Images are to be a minimum resolution of 300 dpi at 100% size. Patterns, not shading, should be used to distinguish areas within graphs or other figures. Unacceptable illustrations will result in rejection of the manuscript. Authors are also strongly encouraged to submit an electronic version (.cdr, .cpt, .gif, .jpg, and .tif formats) of all figures in individual files that are separate from the electronic file containing the text and tables.

Special Sections

Letters to the Editor:

Submission of letters regarding topics relevant to the Society or creation science is encouraged. Submission of letters commenting upon articles published in the *Quarterly* will be published two issues after the article's original publication date. Authors will be given an opportunity for a concurrent response. No further letters referring to a specific *Quarterly* article will be published. Following this period, individuals who desire to write additional responses/comments (particularly critical comments) regarding a specific *Quarterly* article are encouraged to submit their own articles to the *Quarterly* for review and publication.

Editor's Forum:

Occasionally, the editor will invite individuals to submit differing opinions on specific topics relevant to the *Quarterly*. Each author will have opportunity to present a position paper (2000 words), and one response (1000 words) to the differing position paper. In all matters, the editor will have final and complete editorial control. Topics for these forums will be solely at the editor's discretion, but suggestions of topics are welcome.

Book Reviews:

All book reviews should be submitted to the book review editor, who will determine the acceptability of each submitted review. Book reviews should be limited to 1000 words. Following the style of reviews printed in this issue, all book reviews should contain the following information: book title, author, publisher, publication date, number of pages, and retail cost. Reviews should endeavor to present the salient points of the book that are relevant to the issues of creation/evolution. Typically, such points are accompanied by the reviewer's analysis of the book's content, clarity, and relevance to the creation issue.

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Creation Research Society

History—The Creation Research Society was organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a need for an association devoted to research and publication in the field of scientific creation, with a current membership of over 600 voting members (graduate degrees in science) and about 1000 non-voting members. The *Creation Research Society Quarterly* is a peer-reviewed technical journal. It has been gradually enlarged and modified, and is currently recognized as one of the outstanding publications in the field. In 1996 the *CRSQ* was joined by the newsletter *Creation Matters* as a source of information of interest to creationists.

Activities—The Society is a research and publication society, and also engages in various meetings and promotional activities. There is no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund and research center are maintained to assist in such projects. Contributions to the research fund for these purposes are tax deductible. As part of its vigorous research and field study programs, the Society operates The Van Andel Creation Research Center in Chino Valley, Arizona.

Membership—Voting membership is limited to scientists who have at least an earned graduate degree in a natural or applied science and subscribe to the Statement of Belief. Sustaining membership is available for those who do not meet the academic criterion for voting membership, but do subscribe to the Statement of Belief.

Statement of Belief—Members of the Creation Research Society, which include research scientists representing various fields of scientific inquiry, are committed to full belief in the Biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution) both of the universe and the earth with its complexity of living forms. We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. *All members of the Society subscribe to the following statement of belief:*

1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.
2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.
3. The Great Flood described in Genesis, commonly referred to as the Noachian Flood, was a historical event worldwide in its extent and effect.
4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Savior. The act of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation can come only through accepting Jesus Christ as our Savior.

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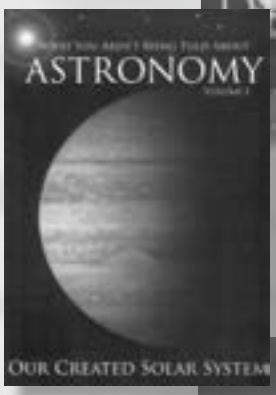

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