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THE EVOLUTION OF DINOSAURS:
MUCH CONJECTURE, LITTLE EVIDENCE

THE REGION OF EDEN

STELLAR RADIATION ENTROPY

PROVENANCE STUDIES OF CLASTIC SEDIMENTS

ARE THE ASHFALL SEDIMENTS
AND FOSSILS POST-FLOOD?

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and Fossils Post-Flood? 81
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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



Editorial

Shakespeare or Bonzo

There's an infinite number of monkeys outside who want to talk to us about this script for Hamlet they've worked out.

—The Hitchhikers' Guide to the Galaxy

“It was, I think, Huxley, who said that six monkeys, set to strum unintelligently on typewriters for millions of millions of years, would be bound in time to write all the books in the British Museum” (Jeans, 1930, p. 4). Thus goes a version of one of the most popular analogies of evolution. Other versions involve much larger groups of monkeys typing different literary compositions, such as the encyclopedia Britannica or the works of Shakespeare.

As with the above quote, the monkey analogy is often credited to T.H. Huxley. A contemporary of Charles Darwin, his staunch defense of Darwin's ideas earned him the nickname “Darwin's Bulldog.” An outspoken nineteenth-century atheist (or agnostic, as he preferred to be identified), Huxley found Darwin's ideas of evolution to be a great comfort for his agnosticism. Surprise, surprise.

More specifically, the origin of the monkey analogy is often linked with the 1860 debate between Huxley and Bishop

Samuel Wilberforce (son of famed British abolitionist, William Wilberforce). To digress for a moment, during this debate Wilberforce chided Huxley with the question of whether Huxley's ape ancestry was on his mother's side or father's side. Huxley is said to have responded that he would rather be descended from an ape than from a man who misused his intelligence to hinder humble seekers of the truth (e.g., see Quimby, 1965, for a retelling of Huxley's response). His response has been credited with energizing the scientific community in support of Darwinism. However, I would challenge anyone to demonstrate to me that Huxley could ever be considered a “humble seeker of the truth.” I also find it interesting that such a superficial and rather flippant response would supposedly have had such a profound effect (or even be credited with having such an effect). This claim actually may be a reflection of the superficial thinking that people often use when evaluating evolutionary teaching.

Also, by some accounts, during this debate Huxley challenged that, given enough time and enough opportunity, random events could achieve the type of biological transformation required by Darwinism. To support this argument, he is alleged to have used the analogy (or one form of it) that an infinite number of monkeys typing on an infinite number

of typewriters would inevitably type a great literary work such as Shakespeare's *Hamlet* (e.g., see Dembski, 1996). Accordingly, some have later claimed that in offering this analogy, Huxley scored a smashing victory in the debate and cast Darwin's claims as acceptable to the British scientific community—very impressive for such a silly analogy. Again, this alleged response may be more a reflection of people's superficial logic than on the rationale of the actual argument.

However, it is unlikely that Huxley presented the monkey analogy at this debate. Although the concept of the typewriter dates to the eighteenth century, by 1860 typewriters still were not sufficiently functional for the purposes of the analogy. There is also no documentation that Huxley made such an argument during the debate. In fact, he is reported to have once said that “the scientific imagination always restrains itself within the limits of probability.” While I do not personally give Huxley credit for seeing how this statement contradicts the monkey analogy; in point of fact, there is little evidence that he ever proposed this analogy during his entire career.

The origin of a “random system” analogy can be dated possibly to the Greek philosopher Aristotle. In his *De Generatione et Corruptione*, Aristotle attempts to describe how the world may

have arisen out of random combinations of atoms. Some form of a “random system” analogy had become popularized enough by the first century BC that Roman philosopher Cicero attacked the claim.

He who believes this may as well believe that if a great quantity of the one-and-twenty letters, composed either of gold or any other matter, were thrown upon the ground, they would fall into such order as legibly to form the *Annals* of Ennius. I doubt whether fortune could make a single verse of them (Cicero, 1877 translation).

It is not known exactly when “typing monkeys” were incorporated into these early “random system” analogies. While Huxley does not appear to have been the originator, since Darwin’s time the monkey analogy has remained a popular argument for evolutionists. As already mentioned, much credit is given to the analogy for favorably influencing early popular opinion toward Darwinism. In fact, as Koestler (1972, p. 30) observes, contemporary neo-Darwinism still car-

ries a distinct influence of extreme nineteenth-century materialism, including the imagery of “the proverbial monkey at the typewriter, hitting by pure chance on the proper keys to produce a Shakespeare sonnet.” In the early twentieth century, Jeans (1930) promoted the analogy by claiming that

if we examine the last page which a particular monkey had typed, and found that it had chanced, in its blind strumming, to type a Shakespeare sonnet, we should rightly regard the occurrence as a remarkable accident, but if we looked through all the millions of pages the monkeys had turned off in untold millions of years, we might be sure of finding a Shakespeare sonnet somewhere amongst them, the product of blind play or chance. (p. 4)

Thus, according to Jeans (1930), it is inevitable that given sufficient monkeys and sufficient time, their random typing will produce some form of literary work. Perhaps this is the analogy’s greatest power: to provide the illusion of an answer to the enormous problem of randomly generating order.

The power of such an illusion attracted Wald (1955) into making the rather foolish argument that

given enough time [the origin of life] will almost certainly happen at least once ... Time is in fact the hero of the plot ... What we regard as impossible on the basis of human experience is meaningless here. Given so much time, the “impossible” becomes possible, the possible probable, and the probable virtually certain. One has only to wait: time itself performs miracles (p. 12).

So, time becomes Wald’s god. Without a shred of evidence to support such a contention, Wald imparts time with the power of creation. This line of reasoning also means that given enough time anything becomes inevitable, including mutually exclusive events—a complete violation of the laws of probability (as

well as rationality). And evolutionists call this science?

Putting flesh and bone to the monkey analogy, a 2002 study by researchers from the University of Plymouth (UK) used six Macaques at a local zoo. For one month a computer keyboard was placed in these primates’ pen, and their resulting keystrokes were recorded. Over the course of this study, the Macaques produced five pages of letters, mostly repeats of single letters (esp. the letter S), but they failed to type a single three-letter word. (The entire transcript of the primates’ “composition” can be found at http://www.vivaria.net/experiments/notes/publication/NOTES_EN.pdf.) While the study provided little scientific insight, it did illustrate the complexity of trying to generate meaningful “information” with random mechanisms. (Actually, the monkeys’ tendency to select and repeat specific keys illustrated that living monkeys are not an adequate randomizing tool for the analogy.)

Despite its popularity, the monkey analogy suffers from several fatal flaws, not the least of which is that it proposes/ requires impossible situations. It is not possible for an infinite number of monkeys or typewriters to exist. Such infinities cannot occur. There is a finite amount of matter in the universe. There is a finite amount of energy in the universe. The fact that the monkey analogy requires impossible parameters illustrates that it is attempting to explain an impossible event (i.e., the naturalist origin of life and its subsequent evolutionary common descent).

Statistically, one monkey has a 1/26 chance of correctly typing the first letter of *Hamlet*. The chance of the next letter it types being correct is 26 x 26; or 1 in 676. With every subsequent letter (even ignoring spacing, punctuation, etc), the probability of a single monkey typing the remaining correct letters shrinks at an exponential rate. For just 25 correct sequential letters, the probability is a mere 1 in 26²⁵.

**Perhaps this is
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generating order.**

Adding more monkeys and time does little to solve the problem. Even with the known universe filled with monkeys typing for billions of years, their probability of successfully producing *Hamlet* drops to an almost incalculably low number (Wikipedia suggests a probability of 1 in $10^{183,000}$; see http://en.wikipedia.org/wiki/Infinite_monkey_theorem). Thus, “the probability of *Hamlet* is therefore zero in any operational sense” (Kittel and Kroemer, 1980, p. 53). That somehow the analogy attempts to claim the monkeys *must* inevitably succeed is an erroneous attempt to gloss over the very real statistical impossibility faced by the analogy.

What is more, such “infinite” parameters—like that promoted by Wald (1955)—are statistical nonsense. These involve what Mora (1965, p. 45) labels as “infinite escape clauses.” He further argues that “when for practical purposes the concept of infinite time and matter has to be invoked, that concept of probability is annulled. By such logic we can prove anything” (Mora, 1965, p. 45). If such logic can prove anything, then it actually proves nothing. These “infinite escape clauses” are an attempt to escape (i.e., ignore) the physical bounds that keep them from being possible. They attempt to establish parameters (no matter how unrealistic) that make “impossible” events possible. It seems I read something about that in *Alice in Wonderland*.

More recently, science philosopher Michael Ruse attempts to salvage the monkey analogy by adjusting the parameters.

Suppose, however, that everytime the monkey strikes the “right” letter, it records; but, suppose also that “wrong” letters get rubbed out (literally or metaphysically!). And suppose that the elimination of the wrong letter is the full consequence of a “mistake”: one does not lose what has already been typed ... evolution of life occurs in this sort

of way. Natural selection allows the successes, but “rubs out” the failures (Ruse, 1982, p. 308).

Interestingly, in an attempt to make the analogy more realistic, Ruse (1982) incorporates a number of unrealistic features. His presentation of chemistry and biology are extremely naïve. In neither “origin of life” chemistry nor evolutionary biology do we find all the “mistakes” eliminated and all the “right” changes preserved. In a pre-biological world, there is not sufficient selection to eliminate chemical mistakes, such as optical impurity. (This is one reason many evolutionists often argue that the origin of life should not be considered as part of Darwinian evolution; it does not fit the criteria for Darwinian selection to occur.) In the biological world, many of the “right” changes are not maintained, while many of the mistakes (i.e., deleterious mutations) are not removed. In fact, these remaining mistakes contribute to the genome’s overall decay (Sanford, 2008).

Knowing that the monkey analogy, in its purest form, would never work, Richard Dawkins also altered the parameters (Dawkins, 1986). Starting with a string of 28 letters and spaces, Dawkins developed a computer simulation that randomly changed these characters in repeated cycles until it obtained the Shakespearean phrase, *METHINKS IT IS LIKE A WEASEL*. However, in this simulation, instead of seeking whether monkeys could type the entire phrase *in totality*, Dawkins incorporated a mechanism that he identified as cumulative selection. The first cycle generated a number of different strings of letters (i.e., progeny), each with random changes to the initial arrangement of letters. Unlike monkeys typing, his cumulative selection approach searched through these various progeny strings and identified the string of letters closest to the desired phrase. It then repeated the process using only this closer match. All remaining progeny were discarded. This process enabled the

simulation to steadily approach the desired phrase with each progressive cycle. Not surprisingly, Dawkins reported that his simulation could consistently produce the Shakespearean phrase in less than 100 cycles.

One realistic parameter Dawkins ignored, among many, is that his simulation had no means for failure. It was destined to succeed. Whether it required 100 or 1000 cycles, the probability of the simulation finally achieving the desired phrase was 100%. There was no mechanism by which certain letters or combination of letters would terminate the entire process. Thus, regardless of the letter combinations achieved with each cycle, the simulation would proceed ever onward toward its inevitable conclusion.

In the chemical and biological world, though, failure is not only an option but is always extremely likely. Had Dawkins appropriately programmed “failure” events into his simulation, the outcome clearly would have been much different. Maybe he knew this; maybe he was just blissfully ignorant.

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So, what did Dawkins's simulation prove? Absolutely nothing. Yet, his WEASEL simulation is still frequently cited. In fact, attempts to emulate or promote his simulation can be found at various websites (e.g., <http://home.pacbell.net/s-max/scott/weasel.html>). As with Dawkins's original program, these simulations also appear to have no mechanism for failure. This absence of realism allows the programs to achieve virtually any sequence of letters, regardless of how "impossible" obtaining that sequence may initially appear. Again, the popularity of such simulations likely reflects people's attraction to the illusion of an answer rather than a truthful answer that they do not want to hear.

One additional point: Even if somehow monkeys randomly strumming on typewriters could plausibly generate *Hamlet*, we know this is not how *Hamlet* was written. Bonzo does not replace Shakespeare. Rather, this illustrates (again!) how materialistic bias can misinterpret events. Dawkins's (1986, p. 1) dismissal of biological systems as "complicated things that give the appearance of having been designed for a purpose" does not make such systems any less a product of purpose and design. The alleged plausibility that Bonzo and his brothers could write *Hamlet* does not erase the fact that it was written by Shakespeare. The plausibility (at least in Dawkins's mind) that naturalistic mechanisms could create purposeful design does not erase the fact that such design is from the Creator. Plausibility does not replace historical reality. Impossibility does not somehow slip into the realm of possibility, regardless of the amount of wishful thinking or repeated proclamation. (What was it Hitler said? Repeat a lie often enough and people will eventually believe it.)

The monkey analogy should never have been taken as a serious scientific concept. Those evolutionists offering it as such only reveal their scientific ignorance and the unscientific nature of their

"theory." Even the attempts to make the analogy more "realistic" are still forced to introduce unrealistic parameters in order for the analogy to even have the illusion of success. That people were once influenced by the claim of this analogy is unfortunate. That people may continue to be influenced by its claim is inexcusable.

Originally, the previous paragraph was my concluding remark. However, it has become evident to me that the monkey analogy is as popular as ever in the writings of physicists and cosmologists. When they speak of "multiverses" or "Landscapes," they are actually just employing infinite monkeys and typewriters. Because it is so improbable that naturalistic mechanisms could account for such an orderly design within our universe (not to mention the improbability of life), then the solution is more universes. Ultimately, the thinking is that there exists an infinite number of universes (insert infinite number of monkeys), each with its own set of physical laws and parameters (Ellis et al., 2004). Thus, just as with the purpose of the monkey analogy, those pesky "improbabilities" become meaningless. An infinite number of universes provide the ability of impossible things becoming possible. All we need is enough monkeys ... ur ... enough universes typing away, and eventually one of them will hit the right combination of events and win the "it looks designed" jackpot.

We can no more measure and observe infinite universes than we can infinite monkeys. Such thinking exists only in the calculations of physicists who have concluded that just one universe is not sufficient for naturalism to give us life and order. It needs more to work with than just our single universe. After all, for naturalism to replace God, it needs all the help it can get.

Kevin Anderson, Ph.D.

Editor

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Are the Ashfall Site Sediments and Fossils Post-Flood?

Michael J. Oard*

Abstract

The fossils and sediments from Ashfall Fossil Beds State Historical Park are analyzed to determine whether the depositional environment was Flood or post-Flood. Several indications of a post-Flood environment are presented, but other criteria suggest the fossil beds were laid down by the Flood, and evidence for a post-Flood environment can be explained within a Flood model. Like dinosaur tracks, eggs, nests, and bonebeds, this site can be explained as a landscape briefly exposed during the Flood by local or regional fall in “sea level.” The existence of mammal tracks places the time as early Flood.



Figure 1. A rhinoceros fossil graveyard within the Rhino Barn at Ashfall Fossil Beds State Historical Park in northeast Nebraska.

Introduction

Correctly distinguishing rocks and fossils deposited by the Flood from those laid down before or after the Flood is a crucial task for diluvialists. Every location needs to be evaluated on its own merits, since the specific chronostratigraphy of the geologic column cannot be trusted, even if its general sequence is accurate (Oard, 2006). This is especially true for the “Cenozoic” and the Miocene. Ashfall Fossil Beds State Historical Park in northeast Nebraska presents an interesting example.

“Miocene” is a date applied by uniformitarian scientists based on certain index fossils and radiometric dates. It is entirely possible that some “Miocene” rocks were deposited in the Flood (Oard,

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2001). Even some Pleistocene deposits could be from the Flood (Holt, 1996). This is because the final or the retreating stage of the Flood (Walker, 1994) was primarily an *erosional* event in higher elevations like the western United States. If significant thicknesses of strata were eroded during this final stage, the remaining strata would likely be from the first half of the Flood—the inundatory stage (Walker, 1994).

If we cannot identify Flood strata based on their relative position in the geologic column, then how are we to determine which rocks were products of the Flood? To answer this question, I developed eleven criteria (Oard, 2007). As I continue to expand and refine that list, I have found that many of them are applicable to the Ashfall fossil site (Table I).

The Ashfall Site

The Ashfall Fossil Beds State Historical Park in northeast Nebraska represents a unique assemblage of fossils, mostly preserved in ash. Hundreds of fossil types are concentrated here; during excavations in 1978–1979, more than 200 fossil mammals were discovered. Some were left in place, and a barn, called the Rhino Barn (Figure 1), was built to preserve them for public viewing. Fossil species include rhinoceroses, five species of horse, camels, deer, three species of birds, a giant tortoise, and two small carnivores. In ongoing excavations, fossils are found almost every day, and the number of species continues to rise. For instance, in the first half of the summer of 2008, fossil hunters discovered elephant and rhinoceros tracks, a giant tortoise, bones from a four-tusked elephant, hatchling turtle bones, coprolites, scavenged bones, and an oreodont's jaw (Figure 2). The site is appreciated by paleontologists because all fossils are well preserved and many are fully articulated.

Akridge and Froede (2005) interpreted the site as a post-Flood environ-

Table I. Environmental deductions from the eleven diagnostic criteria of Oard (2007).

Diagnostic Criterion	Environment
Thin, widespread sediments	Flood
Huge volume	Flood
Lithified sediments	Post-Flood
Permineralized fossils	Post-Flood
Thick, pure coal seams	N/A
Widespread and/or thick evaporites	N/A
Tall erosional remnants	N/A
Planation surfaces or pediments	Flood
Long-transported cobbles and boulders	Flood
Water and wind gaps	N/A
Part of continental margin	N/A

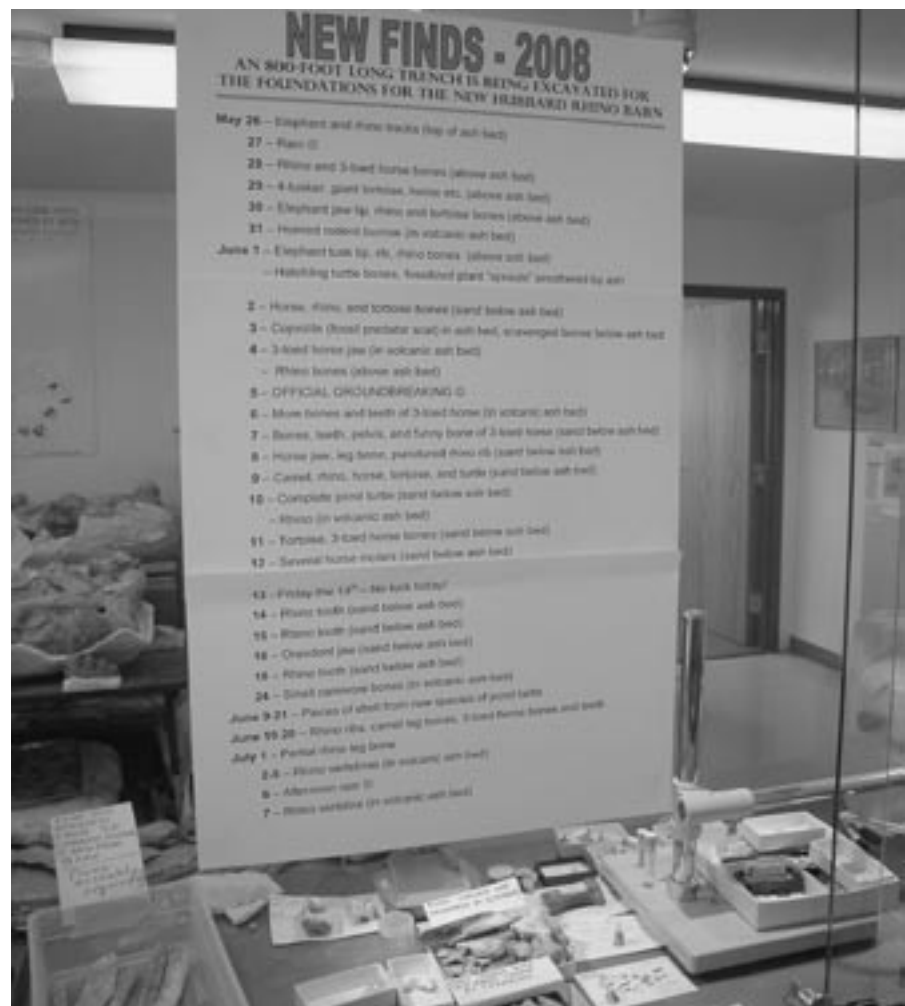


Figure 2. The fossil finds at Ashfall Fossil Beds State Historical Park during the first half of the 2008 summer season.

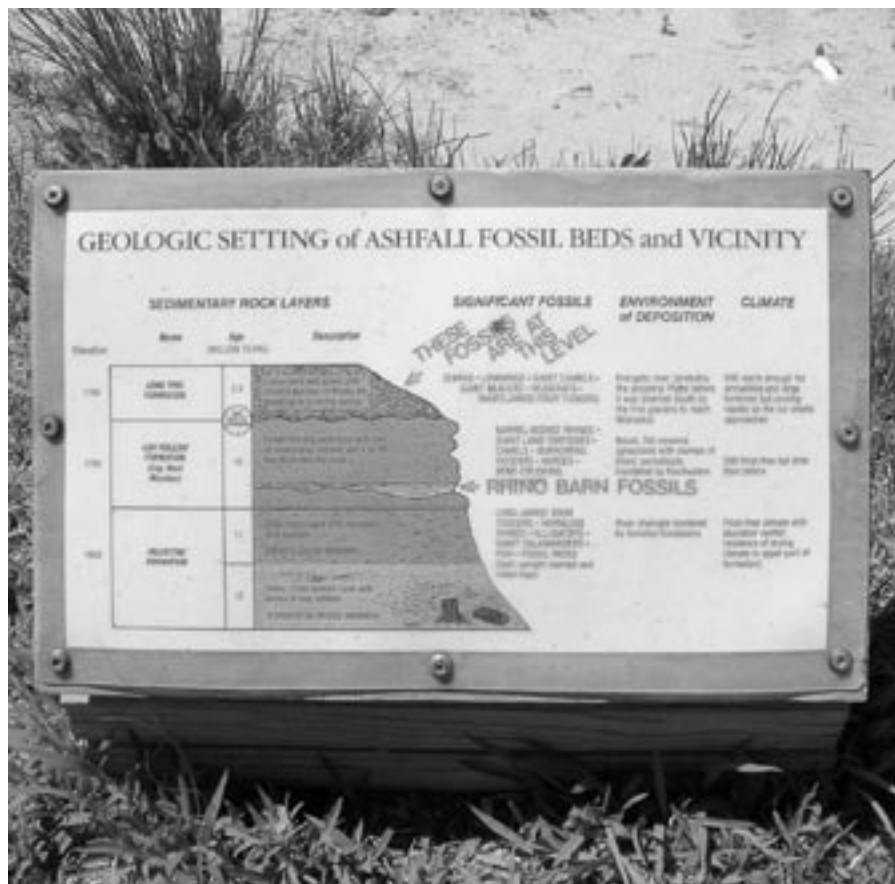


Figure 3. The stratigraphy of the Ashfall Fossil Beds Park.

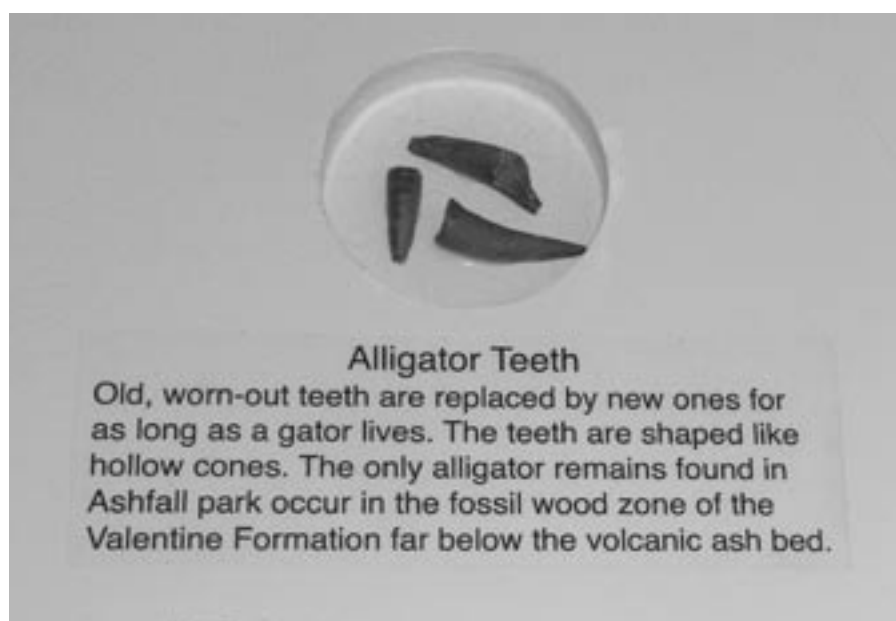


Figure 4. Alligator teeth found in the Valentine Formation below the ash bed.

ment preserved by Ice Age volcanism in a catastrophic manner. Many aspects of the animals' deaths are inconsistent with the uniformitarian story presented at the visitor's center (Akridge and Akridge, 2008). But the evidence for the timing of the ashfall event is not clear. Despite some evidence that the fossils were formed after the Flood, there is other evidence that seems to indicate a Flood origin. Based on previously established criteria to differentiate between Flood and post-Flood strata, I will attempt to show that the site formed during the Flood.

The stratigraphy of the Ashfall area is shown in Figure 3. The fossils are mainly found within the ash layer of the Ash Hollow Formation, a well-indurated sandstone (Akridge and Froede, 2005). This ash averages about 1.0 ft (30.5 cm) in thickness but reaches 10 ft (3 m) in thickness locally. Many of the articulated fossils are found in the thickest zone of the ash, which geologists have interpreted as a watering hole. There is a systematic vertical change upwards in the ash layer, from small aquatic animals to the larger mammals found in the upper zones of the thicker ash.

The Ash Hollow Formation is bounded below by the Valentine Formation, which is about 70 ft (21.3 m) thick and contains fossils of four-tusked elephants, alligators, and fish, as well as petrified wood (Figure 4). Above the Ash Hollow is the Long Pine Formation, which contains gravel and cobbles up to 5 in (13 cm) in diameter from lithologies derived from the Rocky Mountains. According to the geologic timescale, there is a hiatus of 7.5 million years between the Ash Hollow and Long Pine Formations.

Evidence for a Post-Flood Environment

Evidence for a post-Flood entombment of the fossils takes several forms. Tracks of hoofed animals indicate the presence of live animals at the site. Since animal tracks would not be expected during

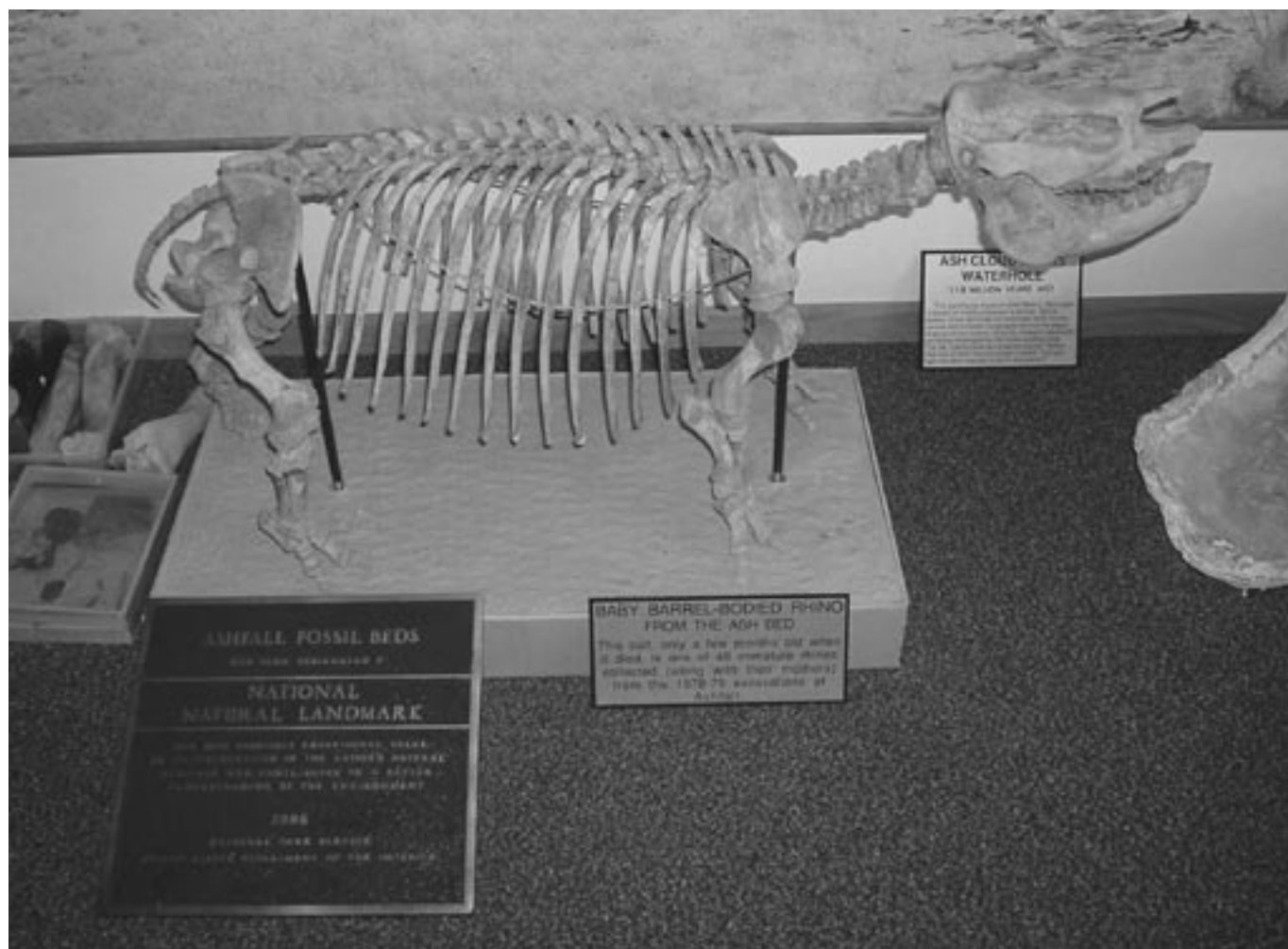


Figure 5 (*above*). One of many baby rhinoceros skeletons found at the Ashfall site.

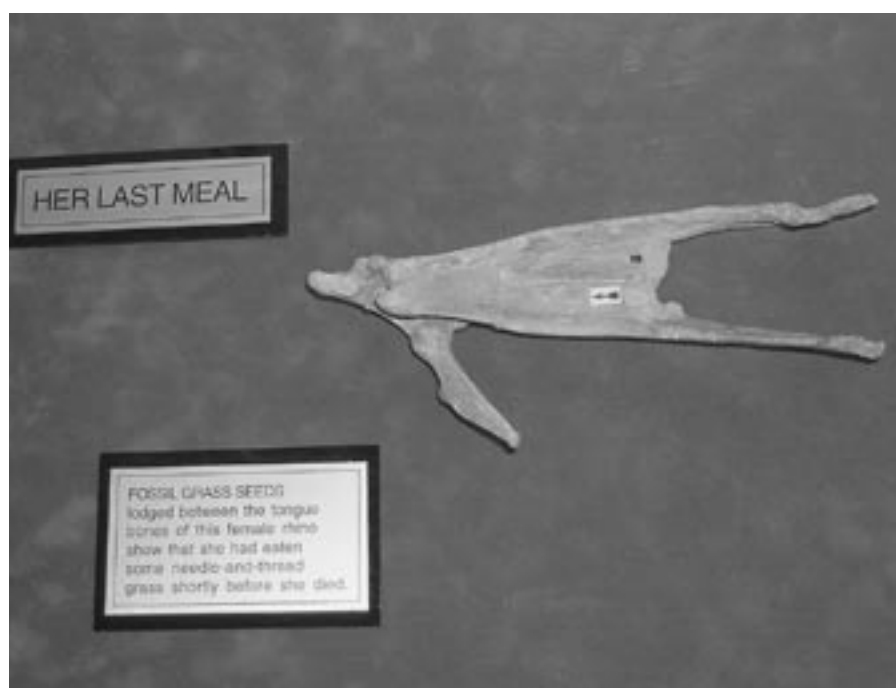


Figure 6 (*left*). Grass fossils found between the tongue bones of a rhino.

the latter stages of the Flood, after all the animals outside the ark had been destroyed, these tracks would suggest either early Flood sediments or post-Flood deposits. The presence of thousands of feet of fossiliferous sediments under the Ash Hollow Formation would rule out a pre-Flood origin.

Fossils of baby animals and even fossil fetuses within adult fossils (Figure 5) suggest an environment where animals lived and bred, seemingly anomalous to the early chaos of the Flood. Contrary to dinosaur bonebeds, where the youngest dinosaurs are inevitably absent (Oard, 2009), the ashfall site contains everything from fetuses to mature creatures.

This site also suggests a terrestrial environment, not marine encroachment. Coprolites found in the area would not be expected to survive an aqueous environment. Land animal bones show signs of scavenging and trampling, also terrestrial activities. Freshwater diatoms imply freshwater streams or lakes in the vicinity. Also, grass has been found in the stomachs and mouths (Figure 6) of some of the animals, indicating they were feeding in a grassy environment before being engulfed by ash.

The fossils have minimal permineralization, which means that silicon dioxide or other chemicals have been little absorbed within the bones of the animals. This observation is an indicator of a post-Flood environment (Oard, 2007). Lithified sediments and permineralized fossils would result from the movement of mineral-rich water under high pressure through Flood sediments. Rapid deposition would cause rapid cementation and permineralization. Post-Flood and present-day environments would be low in cementing chemicals such as silica. Therefore, lithification and permineralization would be rare after the Flood. The ash at Ashfall Fossil Beds State Historical Park is poorly consolidated and the fossils are not significantly permineralized.

Evidence for a Flood Environment

But other evidence argues for a Flood origin for these fossils. The site meets many Flood criteria (Oard, 2007). First, the presence of “thin, widespread sediments” or sedimentary rocks suggests Flood deposition. The Ash Hollow and Valentine formations belong to the Ogallala Group. These formations continue west into the subsurface; ash bed markers can be correlated in wells to the west of the fossil site. This suggests that the ash layer in the Ash Hollow Formation is widespread. The entire Ogallala Group covers an area of around 300,000 mi² (777,000 km²) east of the Rocky Mountains (black area in Figure 7) (Oard, 2008a), and the Ogallala once covered 590,000 mi² (1.53 million km²) before erosion removed the shaded areas in Figure 7. The Ogallala Group ranges from 3 ft (0.9 m) to 800 ft (244 m) thick and is composed mostly of sandstone with interbedded coarse gravel and conglomerate derived from the Rocky Mountains (Figure 8). The Ash Hollow and Valentine Formations, and indeed

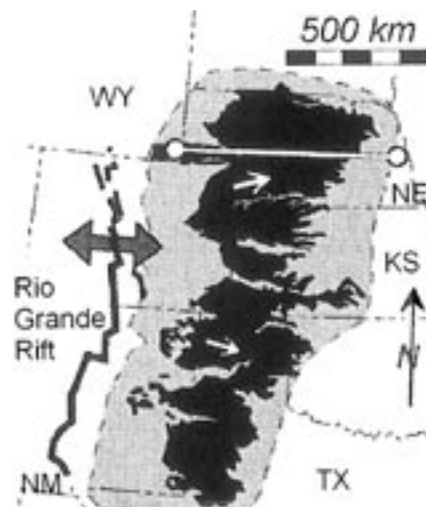


Figure 7. Distribution of the Ogallala Group on the central and southern High Plains of the United States, modified from Thornbury (1965) and Heller et al. (2003). Map shows observed (black) and inferred (shaded) original distribution. White arrows show generalized paleocurrent directions.



Figure 8. Ogallala Group gravel along Smokey Hill River, Highway 23, Kansas.



Figure 9. Sherman planation surface, the Gangplank, with monadnocks in the distance (viewed southwest from near milepost 346, Interstate 80, Wyoming). This surface extends from near the pass east of Laramie, Wyoming, east into western Nebraska.

the entire Ogallala Group, would appear to qualify as Flood-deposited sediments based on the diagnostic criteria of “thin, widespread sediments” (Oard, 2007).

Second, the immense volume of sediment in the Ogallala Group suggests the Flood. Since the Ash Hollow Group is a part of the Ogallala, it too would have to be a Flood deposit.

A number of the criteria are not applicable to the ashfall site (Table I). That of planation surfaces or pediments on or above the sedimentary rock may be applicable indirectly. Although there is no such planation surface or pediment around the site, all of northeast Nebraska could be considered a rough planation surface or an erosional surface. A well-known planation surface extends from the Continental Divide just east of Laramie, Wyoming, into central Nebraska along Interstate 80. Called “The Gangplank” (Figure 9), it truncates a wide variety of igneous and sedimentary rock, including the Ogallala Formation

(Thornbury, 1965). If the Ash Hollow and Valentine formations are correlative across the entire Ogallala Group, then the “Gangplank” would suggest that they were deposited during the Flood.

Resistant boulders and pebbles from the Rocky Mountains are common in the Ogallala Group. At the ashfall site, the Long Pine Formation includes these Rocky Mountain clasts. I suspect that they are a facies of the Ogallala Group, though dated 7.5 million years younger. The age discrepancy might be due to questionable biostratigraphic dating.

Table I provides a summary of the evidence for and against Flood deposition of the Ash Hollow Formation. Two criteria favor a post-Flood environment and four a Flood environment. But other indicators also suggest a Flood environment.

Other Flood Criteria

As a follow-up to the Oard (2007) criteria, I am developing additional indicators

that can distinguish between Flood and non-Flood strata. Several of these new criteria can be applied to the Ash Hollow Formation. Some of these have been mentioned before (e.g., Oard, 1996).

One is the amount of erosion at any given site. For example, the timing of the Green River Formation is a point of debate among creationists. I previously calculated that up to 17,000 ft (5.2 km) eroded from the north limb of the San Rafael Swell (Figure 10) of which the top formation is the Green River Formation (Oard and Klevberg, 2008). This strongly suggests that the formation was deposited during the Flood. Post-Flood processes would be incapable of this much erosion and transport of the debris off the continent. Similar amounts on the Colorado Plateau (Schmidt, 1989) suggest that exposed strata are also Flood deposits.

Post-Flood processes would be hard pressed to explain the erosion of the Ogallala Group, which is estimated to extend over 290,000 mi² (751,100 km²). Holt (1996) also thinks that Ice Age erosion was insignificant. The correct sequence of events late in the Flood over this region appears to be: 1) widespread sheet deposition on the High Plains, 2) widespread sheet erosion, and 3) channelized erosion forming today’s river valleys. That sequence fits well with Walker’s (1994) late inundatory stage for the sheet deposition, the early retreating stage for the sheet erosion, and the late retreating stage for the channelized erosion (Walker, 1994; Oard, 2008b).

Another item of interest is the presence of warm-climate animals in the Ash Hollow Formation. Alligator teeth have been found in the Valentine Formation and giant land tortoises in the Ash Hollow and Long Pine Formations (Figure 11). These animals indicate *winter temperatures above freezing* (Hutchison, 1982; Markwick, 1998). A climate this warm in the interior of North America during the Ice Age is unlikely, even if the Ice Age was delayed, because winter

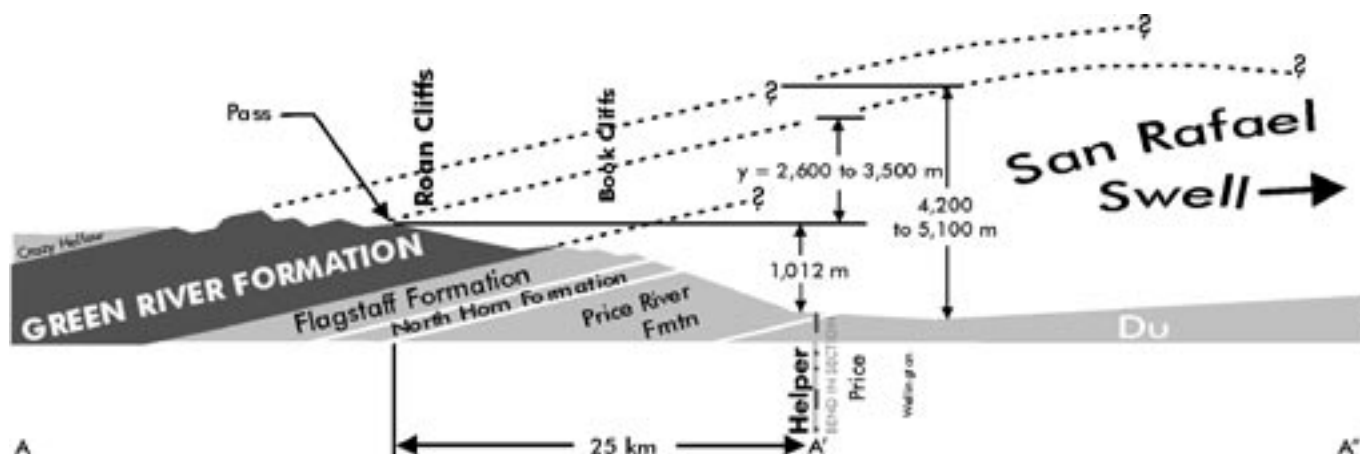


Figure 10. Cross section of the sedimentary rocks of the north limb of the San Rafael Swell. Dashed lines with question marks show the strata projected up over the San Rafael Swell, assuming no change in thickness. Du means diluvial undifferentiated. Note that the total erosion is 14,000-17,000 ft (4.3 to 5.2 km). Drawn by Peter Klevberg.



Figure 11. Giant land tortoise fossil from the Ash Hollow Formation. Some weighed up to 500 lb (227 kg).



Figure 12. The Nebraska Sand Hills.

temperatures depend mainly upon the *angle* of the sun (Oard and Klevberg, 2008). The angle of the sun would be the same in winter right after the Flood as it is now. Additional cooling would be expected due to the abundant ash in the atmosphere, which would be expected due to the numerous ash beds in the Ogallala Group and other Cenozoic sedimentary rocks on the High Plains (Carlson, 1993).

The types of animals at the ashfall site should be typical of the Ice Age if they are post-Flood. These would include woolly and Columbian mammoths, cave bears, woolly rhinos, dire wolves, ground sloths, one-toed horses, etc. (Oard, 1996). Instead, the ashfall site shows the four-tusked elephants, oreodonts, three-toed horses, and extinct rhinos.

The Nebraska Sand Hills are widespread over north-central Nebraska

(Figure 12) and overlie the Ogallala Group. These deposits are likely from the Flood. They include a large volume of sand deposited from the northwest (Figure 13), being the largest area of stabilized sand dunes in the western hemisphere (Trimble, 1990). The sand hills are far from the Rocky Mountains, and there is no post-Flood source of sand to the northwest. Complicating this scenario even further is the fact that

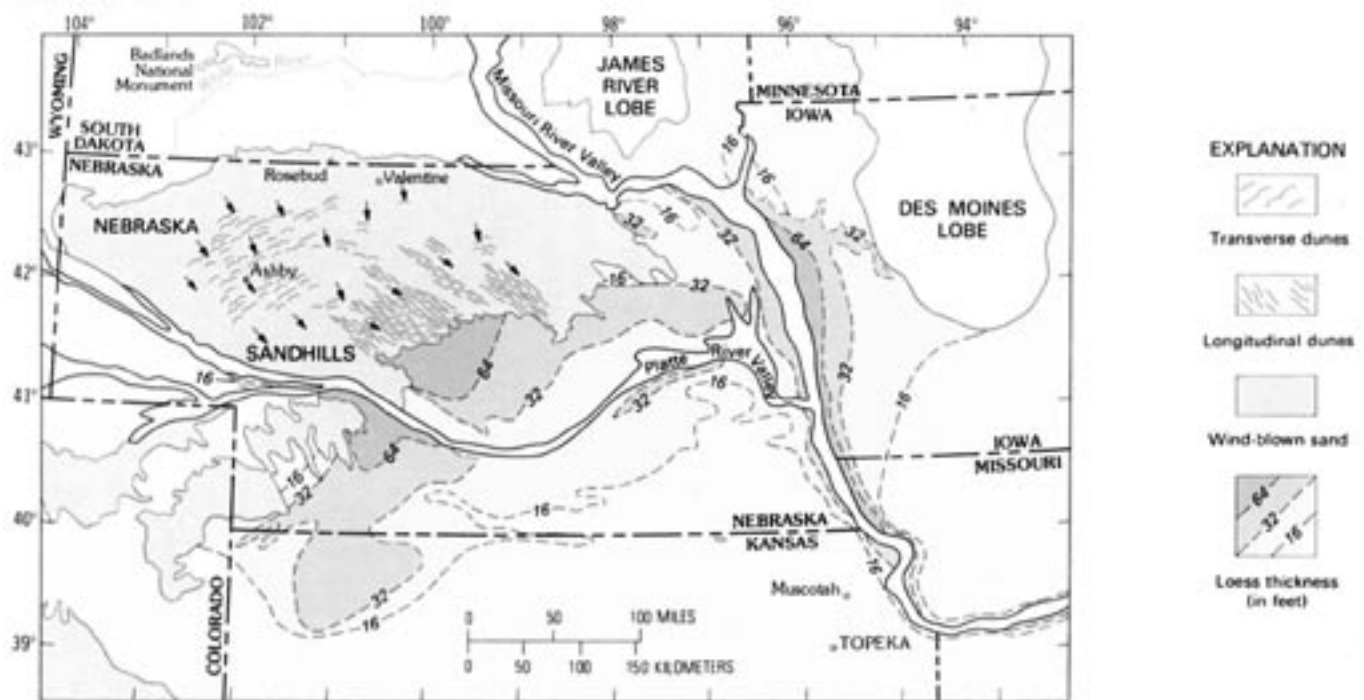


Figure 13. Map of the Nebraska Sand Hills showing large extent and inferred direction of “paleowinds” from the northwest (from Trimble, 1990, p. 31). The elevation decreases northwest of the Sand Hills and there is no known source of sand.

the terrain dips about 1,000 feet (305 m) northwest of the Nebraska Sand Hills into the White River badlands. Also, the Ice Age was too short to have deposited this much sand. Instead, it seems most likely that the Nebraska Sand Hills were deposited at the very end of the Flood and then reworked by Ice Age winds.

These four lines of evidence, added to those in Table I, suggest that the Ash Hollow Formation and its unique fossils were deposited by the Flood. The application of multiple lines of evidence reinforces this conclusion.

How Are the Post-Flood Indicators Explained?

If the Ash Hollow Formation were deposited during the Flood, how are we to explain the post-Flood indicators, such as prints, coprolites, grass, babies, unlithified sediments, and unpermineralized bones?

Although the volcanic ash is unconsolidated, the Ash Hollow Formation is well lithified (Akridge and Froede, 2005). This is often the case with ash beds in Mesozoic and Cenozoic strata of western North America. It is likely that the degree of lithification of the ash is more dependent on diagenetic factors than on the depositional environment.

Diagenetic factors also may explain the lack of permineralization in the fossils too. If insufficient silica were moving through groundwater, then the bones would not be mineralized. This has been observed in dinosaur bones in Montana, which practically all creationists believe died in the Flood. Schweitzer et al. (1997a; 1997b) reported unfossilized bone and organic molecules, possibly even from red blood cells, in a *Tyrannosaurus rex* from sandstone in eastern Montana. This unfossilized skeleton is now located in the Museum of the Rock-

ies at Bozeman, Montana. If dinosaur bones can exhibit soft tissue (Asara et al., 2007; Schweitzer et al., 2005; 2007), then the lack of fossilization at the ashfall site should not be surprising. However, this is a problem for uniformitarians. *Science* quotes Schweitzer as saying, “It was totally shocking. I didn’t believe it until we’d done it 17 times” (Stokstad, 2005, p. 1852).

What Is the Flood Timing?

If the ashfall strata were deposited during the Flood, can we deduce when during the Flood that occurred? I believe so but recognize that the conclusion will be difficult for some creationists to accept. The key line of evidence is the presence of mammal prints at the site. This is diagnostic of deposition during the first 150 days of the Flood (Walker, 1994). Thus, the animals probably died late in the early part of the Flood.

This is supported by the lithifica-

tion of the Ash Hollow Formation. This suggests a fair amount of overburden compressing the formation. If so, that sediment was later eroded. However, that would be expected during the retreating stage of the Flood and should not be surprising. I suspect that the real issue is the unconscious reliance on the geologic column, which suggests that Miocene strata should be late in the Flood or even after it. But our understanding of the Flood is at a rudimentary stage. We should remember Sherlock Holmes's suggestion: "Eliminate all other factors, and the one which remains must be the truth" (Doyle, 1890, p. 92).

Briefly Exposed Flood Sediments

Therefore, any realistic model of the Flood needs to account for local variations in tectonics and eustasy that would

probably cause the emergence of land, explaining the development of short-lived refuges, leading to the formation of dinosaur tracks, eggs, nests, and unique features of dinosaur graveyards (Oard, 1995; 2009). Small regional changes could result in dramatic local falls in relative sea level, exposing sediments already deposited by the Flood (Figure 14). Terrestrial creatures surviving for a short time in the water or on nearby high ground, could occupy the newly raised area for a short time, leaving tracks and laying eggs. Dead or dying animals washed up onto a newly exposed section could create bonebeds when returning waters covered them again. Given enough time, there would be scavenging of bodies or eggs, as deduced from teeth marks and similar indicators. There are at least four mechanisms that

would cause sea level to oscillate locally or regionally.

I believe the ashfall site is similar to the unique features observed at Agate Fossil Beds National Monument in western Nebraska (Oard, 1998). Unique spiral burrows—some containing fossil beavers—have been found there (Figure 15). Mammal tracks are also present. Other similar sites include Toadstool Geologic Park in northwest Nebraska and some valleys in the Rocky Mountains (Lockley and Hunt, 1995). Based on these observations, we must conclude that large regions of the western United States were briefly and periodically exposed before the peak of the Flood at Day 150. This would explain the various tracks, eggs, nests, and bonebeds found in the area. It also would suggest the subsequent erosion of vast thicknesses of sediment that once overlaid these beds.

Therefore, *most of the Tertiary strata of the Rocky Mountain valleys and High Plains are from the inundatory stage of the Flood*. This deduction may be a shock to those creationists who believe the tertiary is late Flood or post-Flood. But it is primarily a shock because many creationists assume that the geological column is a reliable time sequence. According to that yardstick, the tertiary should be late Flood or post-Flood.

But on further thought, maybe it is not such a difficult idea. One would expect the majority of sedimentation *early* in the Flood, since it was most violent during those early stages. The retreating stage, especially over the higher regions of western North America, was a time of vast, rapid erosion, called the "Erodosoic" by Holt (1996). Therefore, by elimination, the strata remaining—even if dated "tertiary" by uniformitarian geologists—are from the inundatory stage of the Flood.

If great thicknesses of strata were eroded late in the Flood, where did they go? The answer is to the east. Erosion in the elevated areas of North America led to the eastward and southward



Figure 14. Location of postulated strip of land or series of shoals in western United States generally parallel to the crest of the Rocky Mountains. There are four megatracksites in black; the newly discovered one in Wyoming contains two megatracksites on different beds (from Oard, 2002, p. 6).



Figure 15. Devil's corkscrew from Agate Fossil Beds National Monument, western Nebraska.

transport of vast amounts of sediment, which were deposited as the coastal plain and continental shelf sediments of the eastern seaboard and the Gulf of Mexico. Some probably were even carried far out onto the abyssal plains (Oard, 2001).

Other aspects of the ashfall site can be explained by this model. Grass found at the site and even in the mouths and stomachs of the dead animals could have sprouted from seeds carried in the atmosphere or in floating vegetation. Grass would sprout quickly under the right conditions.

The presence of fetuses and babies with adults might indicate that these animals rode out the initial violence of the Flood on some high refuge. When lower lands were exposed, they then occupied them together. Coprolites might have been preserved by ash or other rapid burial. There would of course be scavenging and trampling of dead animals before the area was completely re-inundated before Day 150.

The presence of freshwater diatoms needs further analysis. Are they true environmental indicators, or were they transported by Flood currents? Are we sure they are freshwater, or is that simply inferred from a freshwater environment based on the terrestrial fossils at the ashfall site (i.e., circular reasoning)? Since we don't know the chemistry of the floodwaters (which was probably quite variable in space and time), these diatoms may well have been at home in the local conditions.

Contrary to the uniformitarian explanation, Akridge and Akridge (2008) state that Marie's disease or "hypertrophic osteopathy," caused by inhaling volcanic ash, probably was not the cause of death. They cited the time needed for the bone growths to manifest themselves from a single eruption. Uniformitarians correlate the ash at the ashfall site with a volcano 1,000 mi (1,609 km) away in southwest Idaho by chemical tracking. Akridge and Akridge (2008) suggest that "one possibility is the presence of minor

eruptions prior to the major eruption that produced the ashfall that killed and buried the animals" (p. 129). In a Flood scenario, the animals on high refugia were likely subjected to multiple ashfalls and particles from meteoric impacts before they were forced to flee. Thus, the development of Marie's disease might have occurred over the early weeks or even months of the Flood before their final demise.

Summary

Some evidence from the ashfall site suggests a post-Flood environment, but the predominance of evidence indicates that these fossils formed during the early stages of the Flood. The lack of permineralized bones and unlithified ash is not conclusive, since similar features are found in other sediments that were clearly deposited during the Flood.

Regional considerations, such as the thin, widespread sediments; the large volume of sediments; a planation surface above correlative strata to the west; pebbles carried from the Rocky Mountains; evidence for large-scale erosion; subtropical fauna inconsistent with an Ice Age climate; and the likely Flood origin of the overlying Nebraska Sand Hills all argue for a Flood origin.

The presence of tracks and other evidence for living animals strongly suggests that the ashfall site was actually buried prior to Day 150 of the Flood, that a significant volume of sediment was deposited atop the area, and that massive erosion during the retreating stage of the Flood eroded the area back down to the level of the ashfall site. This same model can explain other sites throughout western North America that show dinosaur tracks, eggs, nests, and dinosaur and mammal bonebeds. Marie's disease present in the fossils at the ashfall site may well have been caused by early Flood volcanism and/or meteoric impacts, either of which could have generated the lung disease.

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 JOC: *Journal of Creation, Creation Ex Nihilo Technical Journal*, or *Technical Journal*
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Book Review

The Global Phenomenon of Human Fossil Footprints in Rock

by Aaron Judkins

Maverick Publishing, Granbury, TX, 2008, 424 pp., \$30.00.

In the early summer of 1999, a friend and I attended a paleontology excavation on the Paluxy River in Glen Rose, Texas. Among the volunteer diggers was a young man. This gentleman was very sincere and conscientious, and his name was Aaron Judkins. Over the intervening years, I had the occasion to meet Judkins again and have noted his active role in the creation movement, especially concerning fossil and archaeological excavations.

This is Judkins's second book. He renders a valuable service in compiling an examination of the numerous instances of Ichno-fossils. Paleoichnology deals with trace fossils of which one type is human footprints fossilized in stone.

The book begins with a foreword by Judkins's good friend, the late Henry Johnson. He extols the virtues of free inquiry and academic freedom, quoting such notables as Thomas Jefferson and Albert Einstein. Johnson deftly uses this polemic to turn the tables on evolutionists, who insist that only their origin story be presented in the public

square. Judkins then launches into an extended geological and paleontological critique of evolutionary theory. The author analyzes the philosophical basis for Darwinism and then proceeds to a discussion of the fossil record. He includes the Cambrian explosion, lack of transitional forms, fossil gaps, uniformitarianism, and the profound deficiencies of radioisotope dating. He devotes considerable space to a discussion of the fragmentary history of "fossil man" from the australopithecine apes, homo erectus, and archaic homo sapiens, including the Neanderthals and the Cro-Magnons. If one is a new student to the creation-evolution controversy, Judkins performs a valuable service in bringing the reader up to speed.

It is in chapter 25 that Judkins contributes something comparatively fresh to the debate. He starts off with an anatomy lesson about the human foot and how it is different from those of the apes and is uniquely fitted for ground locomotion. The handlike feet of apes and monkeys make them quadrupeds

using all their limbs for climbing and grasping, or knuckle-walking. The human foot is not designed for swinging in trees or vines but instead for true bipedal ground travel. The footprints of apes and monkeys are different from those made by man and are easily discernible, except for those who claim human prints can't show up in rocks they judge to be too old.

The writer gives a critical survey of Texas Paluxy River tracks, which he has excavated and documented for a number of years. Also discussed are the Laetoli tracks of East Africa and sites in New Mexico, Utah, Australia, Mexico, Nicaragua, Turkmenistan, and France.

This book is written in laymen-friendly prose with a bibliography but no index. It is a valuable critique of evolutionary paleoanthropology and provides a reasonable creation response to the problem of human footprints in stone.

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The Region of Eden: Analysis and Debate

Joel D. Klenck*

Abstract

Eastern Anatolia, southern Iraq, and Jerusalem have been proposed as the regions that once contained the Garden of Eden. Several creationists have argued that it is impossible to locate the region of Eden due to the dramatic changes to the surface of the earth during the Noachian Deluge. However, a close analysis of relevant Biblical passages and the archaeology, geography, geology, paleontology, and paleobotany of Anatolia, the Near East, and North Africa suggest that the region of Eden was located in Southeastern Anatolia. This region provides source waters for four rivers, following Precambrian rift valleys or faults, which are connected to the Biblical locales of Asshur, Havilah, and Cush. The rivers traversed a landmass that originated in the Precambrian not covered by the alleged expanse of the Tethys Ocean. Furthermore, southeastern Anatolia is associated with the ancient kingdom of the House of Eden. Although the Bible states that the Flood was a global catastrophic event, the confluence of biblical texts with geographical, geological, and other data provides a compelling indication that its effects did not eradicate all evidence of Eden's original location.

Introduction

The search for the region that comprised the Garden of Eden is one of the few areas where there is partial agreement between evolutionists and some young-earth creationists. Although their viewpoints are radically different, both concur that the search for Eden is an exercise in futility. For the evolutionists, God, creation, and Eden never existed, so attempts to find the Garden are without merit. Similarly, some creationists have adopted the belief that the search

for Eden is nonsensical. For them, the region of Eden can no longer be located because the Noachian Deluge erased any geographical continuity between the pre-Flood and post-Flood earth.

If the region of Eden could be ascertained, this would have broad implications for future research such as comparisons of site formation processes, geological strata, and the distribution of fauna and flora, inside and outside this region.

Biblical Description

In Genesis 2:8–14, the description of the location of the Garden of Eden is rich in detail:

2:8: *And Jehovah God planted a garden in Eden [5731], to the east; and He put the man whom He had formed there.*

2:9: *And out of the ground Jehovah God made to spring up every tree that is pleasant to the sight, and good for food. The Tree of Life was also in the middle of the garden; also the Tree of Knowledge of Good and Evil.*

2:10: *And a river went out from Eden to water the garden, and from there it was divided and became four heads.*

2:11: *The name of the first is the Pishon [6376]. It is the one surround-*

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ing all of the land of Havilah [2341] where there is the gold.

2:12: And the gold of that land is good and there is bdellium, resin gum, and the stone of onyx.

2:13: And the name of the second river is the Gihon [1521]. It is the one surrounding all the land of Cush [3578].

2:14: And the name of the third river is the Hiddekel [2313]. It is the one going east of Asshur [804]. And the fourth river is the Perat [6578]. (The Interlinear Bible with Strong's Concordance Numbers)

The Hebrew text is clear that the Garden of Eden was the source of four rivers: *Pishon*, *Gihon*, *Hiddekel*, and the *Perat*. A river “went out from Eden” and “from there it was divided and became four heads.” The Hebrew use of the word “from” [מִן] and the fact that the river from Eden became the “head” of the four rivers leaves little doubt that Eden was the origin and not the destination of these four rivers.

Perat and Hiddekel

Of the four rivers associated with the Garden of Eden, the *Perat* [פֶּרַת] is most frequently mentioned river in the Bible and refers to the Euphrates River in modern Iraq and Turkey. After Genesis 2:14, the *Perat* is noted in 18 other verses from Genesis through Jeremiah (Gen. 15:18; Deut. 1:7, 11:24; Josh. 1:4; 2 Sam. 8:3; 2 Kings 23:29; 24:7; 1 Chron. 5:9; 18:3; 2 Chron. 35:20; Jer. 13:4, 5, 6, 7; 46:2, 6, 10; and 51:63). In Akkadian, the river was the *Pu-rat-tu*, and in Sumerian, the *Buramun*.

The *Hiddekel* [חִדְדֵּקֶל] is mentioned in one other verse outside of Genesis 2:14, namely in Daniel 10:4, where the Prophet receives a vision as he “was by the side of the great river, which is the *Hiddekel*.” The author of Genesis 2:14 describes the *Hiddekel* as “the one going east of Asshur.” Sumerians referred to the river as the *Idigna* or *Idigina*. For

the Akkadians, the river was the *Idiqlat*. Nearly all conservative Biblical scholars equate the *Hiddekel* with the Tigris River. The Tigris River is located to the east of the archaeological site of Asshur, or Assur, the ancient capital of the Assyrian Empire (Healy, 1991; Parpola, 2004; Schomp, 2005).

The origin of the modern Tigris and Euphrates Rivers is in Eastern Anatolia, near the city of Elazig, in modern Turkey. Biblical scholars equate the *Perat* and *Hiddekel* with the Euphrates and Tigris Rivers. Most creationists believe that after the Genesis Flood, the *Perat* and *Hiddekel* represent the Euphrates and Tigris Rivers. However, the equation of the Euphrates and Tigris Rivers with the *Perat* and *Hiddekel* before the Genesis Flood is debated and discussed below.

Pishon

The *Pishon* [פִּישׁוֹן] is not mentioned outside the original reference in the second chapter of Genesis. The *Pishon* is described as “surrounding” all the land of Havilah and is associated with gold, bdellium, resin gum, and onyx (Gen. 2:11–12). Although, the *Pishon* is not mentioned again, the land of Havilah is mentioned in several texts after Genesis 2. The location of Havilah is, I believe, instrumental in locating this ancient river, which originated from Eden.

In Biblical texts, Havilah is both a name and geographical location. In Genesis 10:7 and 29, which are replicated in 1 Chronicles 1:9 and 23, Havilah was the name of two men. Both were descendants of Noah. The first was a son of Cush, who was a son of Ham (Gen. 10:6–7). The second was the son of Joktan. Joktan was a descendent of Noah, through Shem, Arphaxad, Shelah, and Eber, who was the father of Joktan (Gen. 10:21–29).

Two passages, Genesis 25:18 and 1 Samuel 15:7, point to the geographical location of Havilah. Genesis 25:18 notes

that the sons of Ishmael lived in an area that extended from Havilah to Shur. Shur is described in Genesis 25:18 as “facing Egypt as you come toward Asshur [Assyria]” (עַל-פְּנֵי מִצְרַיִם בְּאֶמְצָה אַשּׁוּרָה). The origin of the road leading from Egypt to Assyria was located in the northwest region of the Sinai Peninsula. Hence, the region of Shur represented the northwestern area of the Sinai Peninsula.

The second reference to Havilah is found in 1 Samuel 15:7. Here, King Saul moved south from Israel and Judah and struck down the people of Amalek from Havilah to Shur. Shur is described as “before” or “on the face” of Egypt (אַשּׁוּר עַל-פְּנֵי מִצְרַיִם). For Saul to move south, through Havilah, and then to Shur, would indicate that Havilah was in the northeastern region of the Sinai Peninsula.

Also instructive is that King Saul sent a warning to the Kenites to “Go! Depart! Go out from the midst of Amalek, lest I destroy you with them” (1 Sam. 15:6). That the Kenites lived in the northeast region of the Sinai Peninsula is supported by other Biblical texts. Numbers 23:28 states that Balak, the king of Moab, took Balaam to the top of Mount Peor in Moab and oriented him “toward the wasteland.” From here, Balaam could see the land of the Kenites (Num. 24:21). All locales—Moab, Mount Peor, the “wasteland” of the Dead Sea, and the Kenites—are in or near the northeastern region of the Sinai Peninsula (Figure 1). Therefore, the location of Havilah can be deduced.

- Shur is directly east of Egypt in the northwestern region of the Sinai (Gen. 25:18; 1 Sam. 15:7).
- Havilah is near Shur (Gen. 25:18).
- The Kenites lived near Moab (Num. 24:21).
- Moab, Mount Peor, the wasteland, and the Kenites were in or near the northeastern region



Figure 1. Northeastern Sinai Peninsula showing the location of the Wadi HaArava and its associated seasonal rivers.

of the Sinai Peninsula (Num. 24:21).

- e. King Saul warned the Kenites, who were living near the Amalekites, near the land of Havilah (1 Sam. 15:6).
- f. King Saul attacked south from Israel and Judah and then east toward Shur, going through the region of Havilah (1 Sam. 15:7).

Hence, the only locale that Havilah could represent, according to all Biblical sources, is the northeastern region of the Sinai Peninsula. And the determination of Havilah's location is crucial to identifying the *Pishon*.

Today, the Wadi HaArava, a seasonal river, runs through the northeastern area of the Sinai Peninsula. From the Wadi HaArava seasonal rivers emerge, including the Nahal Paran, Nahal Hiyon, Wadi Musa, Wadi Girafi, and the Wadi Rum. These seasonal rivers extend throughout the northeastern Sinai and are similar to the description in Genesis 2:11, where the *Pishon* surrounded the land of Havilah (Figure 1).

Egyptian sources state that the northeastern Sinai was a mining area for gold and other precious stones. Large state-controlled expeditions mined gold, copper ores, and decorative stones in this region, using prisoners, slaves, and occasionally Egyptian peasants (Greaves and Little, 1929). In addition, King Gudea (2144–2124 B.C.) recorded that he imported gold, precious stones, and copper from the Sinai for the temples at Lagash (Lucas, 1962).

With regard to geology, the Wadi HaArava follows an ancient rift valley that extends through Paleozoic strata. This rift valley originates in eastern Anatolia: from the Orontes River, to the Lintani River, the Kinneret (Sea of Galilee), Jordan River, Dead Sea, Wadi HaArava, Gulf of Aqaba, and to the Red Sea. The Orontes, Lintani, and Jordan rivers were interrupted by tectonic and volcanic activity in the Late Cenozoic.

The origin of the Orontes River is adjacent to the source areas for the Tigris and Euphrates, near the modern city of Elazig in Turkey (Figure 2).

In light of Biblical texts, archaeological sources, and geological evidence, I suggest the *Pishon* was an ancient waterway correlating with a rift valley that originated in eastern Anatolia and generally followed the modern Orontes / Litani / and Jordan waterways. The *Pishon* originated in the same area as the Tigris and Euphrates, flowed south away from Eden, and moved through the land of Havilah.

Gihon

The *Gihon* [גִּיחוֹן] is mentioned only in Genesis 2:13 and is described as surrounding the land of Cush. Most conservative Biblical scholars identify Cush as modern Ethiopia. The only extant river associated with Cush is the Nile River and its tributaries. Hence, creationists are confronted with a difficult problem: how to connect the origin of the Tigris, Euphrates, and *Pishon*, with the land of Cush.

The concept of a river connecting eastern Anatolia to Africa is alien to many evolutionary geologists. For the latter, the area of North Africa, the Middle East, and much of Anatolia was under water, beneath the Tethys Ocean, during most of the geological history of the Earth. Benton provides many excellent illustrations of the alleged waters of the Tethys, replete with warm and cold ocean currents, covering the landmasses during the Cretaceous period (Benton, 1996). However, he enigmatically illustrates terrestrial sauropod remains in these alleged marine areas (Figure 3).

Paleontologists and paleobotanists have limited the expanse of the Tethys Ocean by identifying terrestrial faunal and floral remains in areas in the midst of this supposed sea. Woodmorappe (1983), citing a deluge of articles by evolutionists, has plotted these re-

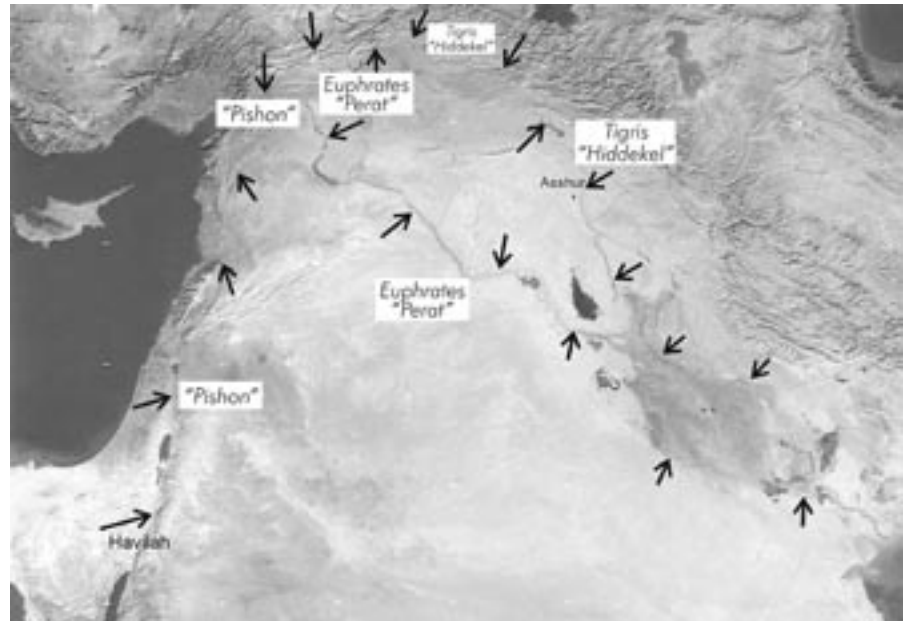


Figure 2. Satellite photograph of the Middle East showing the Tigris and Euphrates Rivers and the rift valley and waterways that once comprised the *Pishon*: the Orontes, Litani, Jordan, and Wadi HaArava.

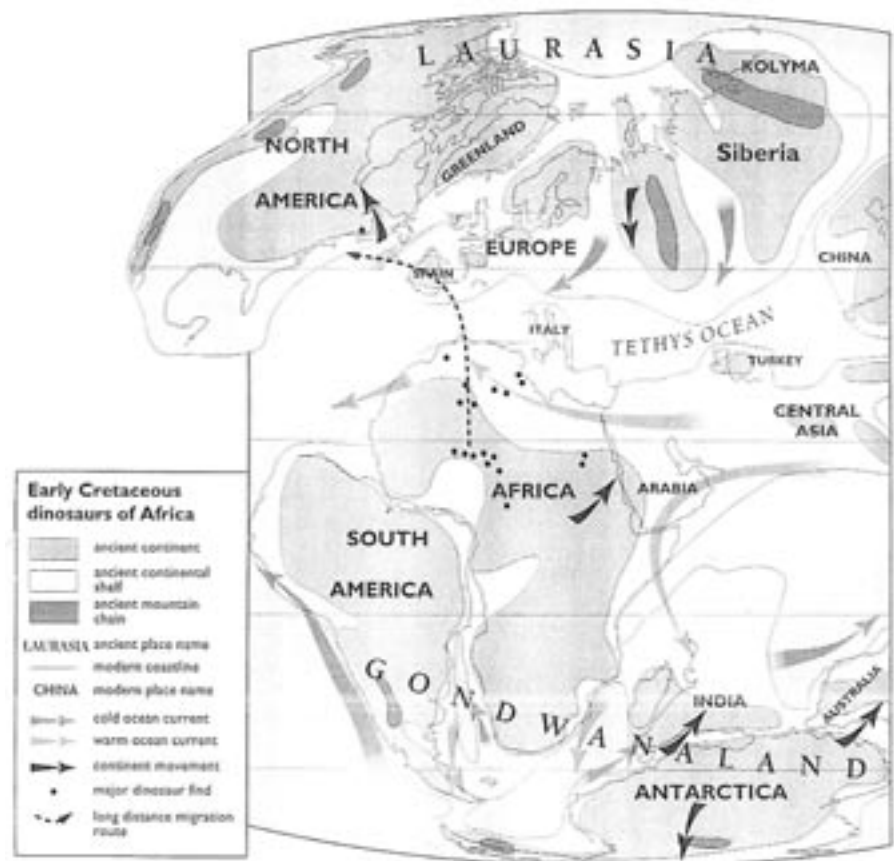


Figure 3. A familiar evolutionary geology view of the areas of North Africa, Middle East, and Anatolia, under the alleged waters of the Tethys Ocean during the Cretaceous (Benton, 1996).

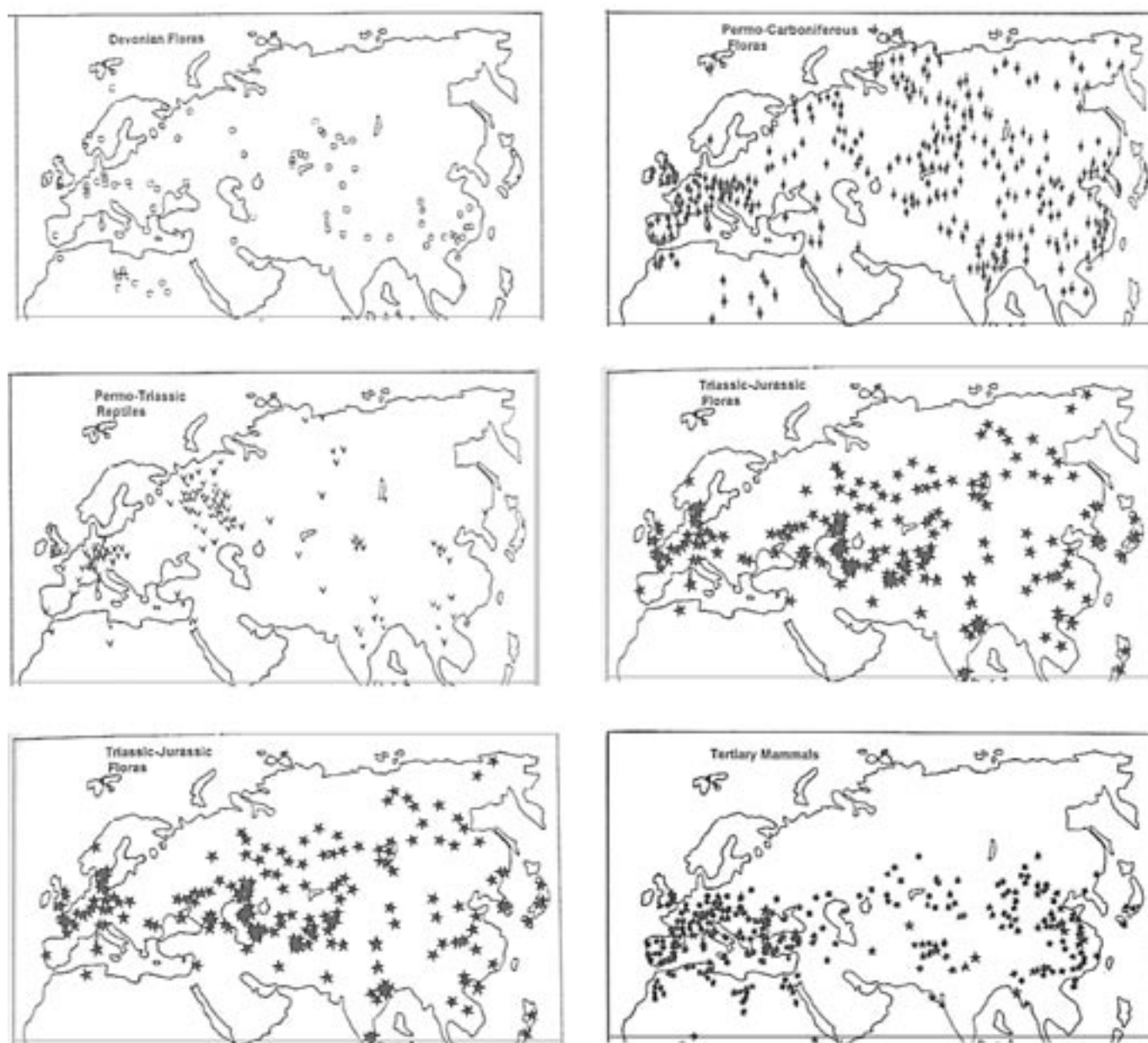


Figure 4. The location of terrestrial faunal and floral remains found in deposits, from the Devonian to the Tertiary, in the midst of the alleged Tethys Ocean (from Woodmorappe, 1983).

mains in Devonian, Carboniferous, Permian, Triassic, Jurassic, Cretaceous, and Tertiary deposits in Anatolia, the Middle East, and North Africa (Anderson and Cruickshank, 1978; Bellini and Massa 1980; Beltan et al., 1979; Charig, 1971; 1973; Cooke, 1972; 1978; Cox, 1973; Davies, 1975; El-Khayal et al., 1980; Glut, 1972; Goldsmith et al.,

1982; Hallam, 1973; Klitzsch, 1981; Lejal, 1975; Savage, 1967; Savage and Russell, 1983; Wesley, 1973).

Since Woodmorappe's article, paleontologists have unearthed more evidence for terrestrial plants and animals in Anatolia and the Middle East. Fragments and cryptospores of terrestrial plants were identified from mid-Ordovi-

cian deposits in Saudi Arabia and Oman, the latter being similar to liverwort (Strother et al., 1996; Wellman et al., 2003). Paleontologists have discovered fungi from terrestrial ecosystems in Permian and Triassic deposits in the Negev, Israel; south Anatolia, Turkey; Saudi Arabia; the southern Alps in Italy; and in Dinarides, Bosnia (Visscher et al.,

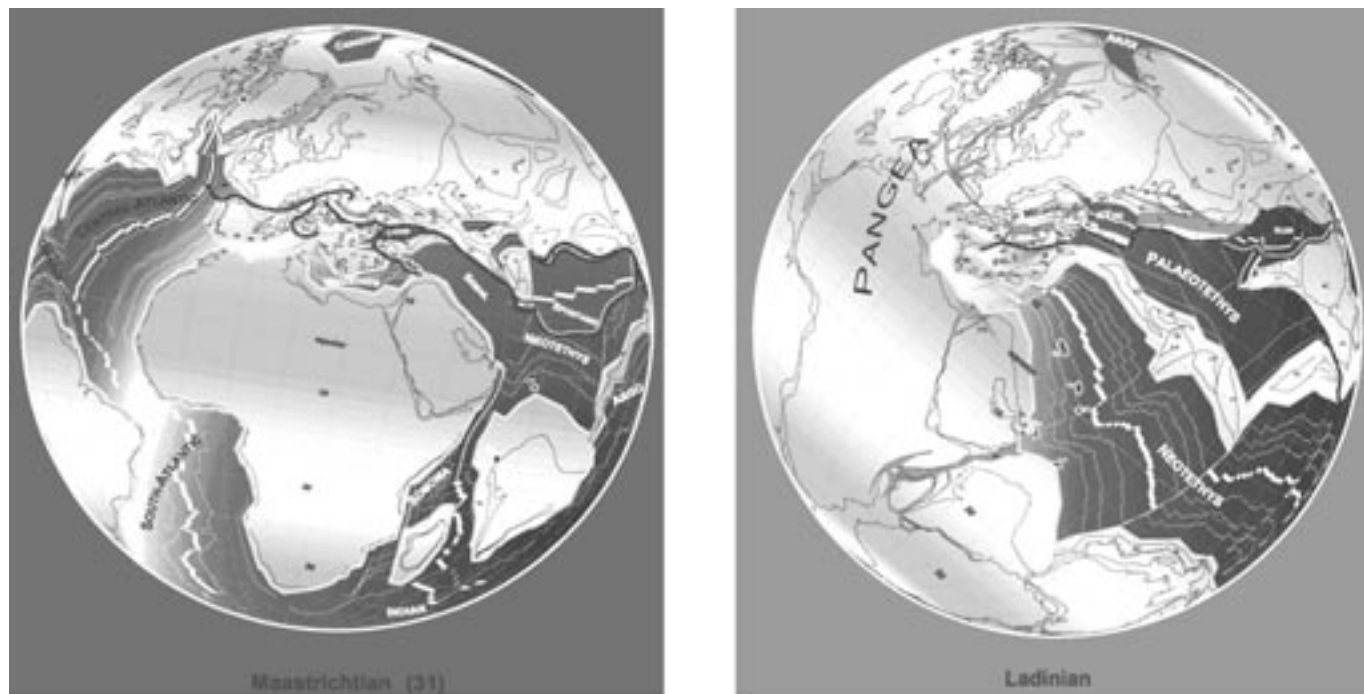


Figure 5. Recent views from evolutionary geologists showing a more restricted Tethys Ocean with Eastern Anatolia, the Middle East, and Africa above the waters. Shown here are two maps exhibiting the extent of the Tethys Ocean and terrestrial land from the Maastrichtian to the Ladinian, allegedly from 69 to 230 MYA (from Stampfli and Borel, 2002).

1996). Palaeobotanists identified fossilized wood in Jurassic and Early Cretaceous strata in Lebanon and Turkey and several tropical species of *Dicroidium*, extinct plants with mostly fernlike foliage but with real seeds, in the Permian Um Irna Formation near the Dead Sea in Jordan (Kerp et al., 2004; Philippe et al., 2006). In Cretaceous (Turonian) deposits in the Negev Desert, researchers identified the remains of insect leaf parasites, deciduous broadleaves, and angiosperms (Dobruskina and Krassilov, 1995; Krassilov, 2008). Paleobotanists have also identified a new species of *Weichselia*, a Mesozoic fern, in Early Cretaceous strata at Makhtesh Ramon, in southern Israel (Silantjeva and Krassilov, 2006). Discoveries of terrestrial fauna include a new species of snake and a brachiosaur in Cretaceous deposits in Lebanon, a salamander in similar strata in Israel, and mammal remains that are too numerous to cite (Buffetaut et

al., 2005; Caldwell, 2006; Nevo and Estes, 1969).

Recently, evolutionary geologists have begun to restrict the alleged expanse of the Tethys Ocean. In a comprehensive treatise, Stampfli and Borel (2002) cite numerous studies from Greece, Iran, Romania, Turkey, Italy, Georgia, Switzerland, and other locales and restrict the expanse of the Tethys Ocean (Alavi et al., 1997; Baumgartner, 1985; Bonneau, 1984; Cioffica et al., 1980; Fleury, 1980; Gutnic et al., 1979; Jurdy et al., 1995; Khain, 1994; Kozur, 1991; 1997; Krahel et al., 1983; Monod and Akay, 1984; Morris, 1996; Niocail and Smethurst, 1994; Okay and Mostler 1994; Pickett and Robertson, 1996; Poisson, 1984; Powell and Li, 1994; Robertson, 1993; Seghedi et al., 1990; Sengor et al., 1980; Stampfli et al., 1991; Stampfli and Marchant, 1997; Stampfli and Pillevuit, 1993; Tuysuz, 1990; Waldron, 1984; Ziegler, 1990; Zonenshain

et al., 1985). In addition they indicate from these geological studies that the area of eastern Turkey, the Tigris and Euphrates region, Israel, Lebanon, Syria, the Sinai Peninsula, and Africa was not covered by the Tethys but represented a vast expanse of terrestrial land, freed from the water, during the Mesozoic and Cenozoic. Their treatise coincides with paleontological and paleobotanical research, especially in regard to the aforementioned riot of terrestrial flora that has been discovered in deposits from Turkey to Arabia, in strata from Paleozoic (Ordovician) through Mesozoic (Cretaceous).

Other conclusions from recent geological studies include that the entirety of the Tigris, Euphrates, and the Orontes / Litani / Jordan rivers rest on geological foundations that descend to Precambrian strata (Ronov et al., 1977; Woodmorappe, 1981). Moreover, the Tigris and Euphrates rivers most likely



Figure 6. The southern end of the expanse that is now the Red Sea. The locale was originally a riverine environment whose southerly progression moved west, forming the East African Rift Valley (white arrows). Later in the Cenozoic, both shores of the valley divided forming the Red Sea. The imprint of this divide is readily apparent in satellite images (black angles).

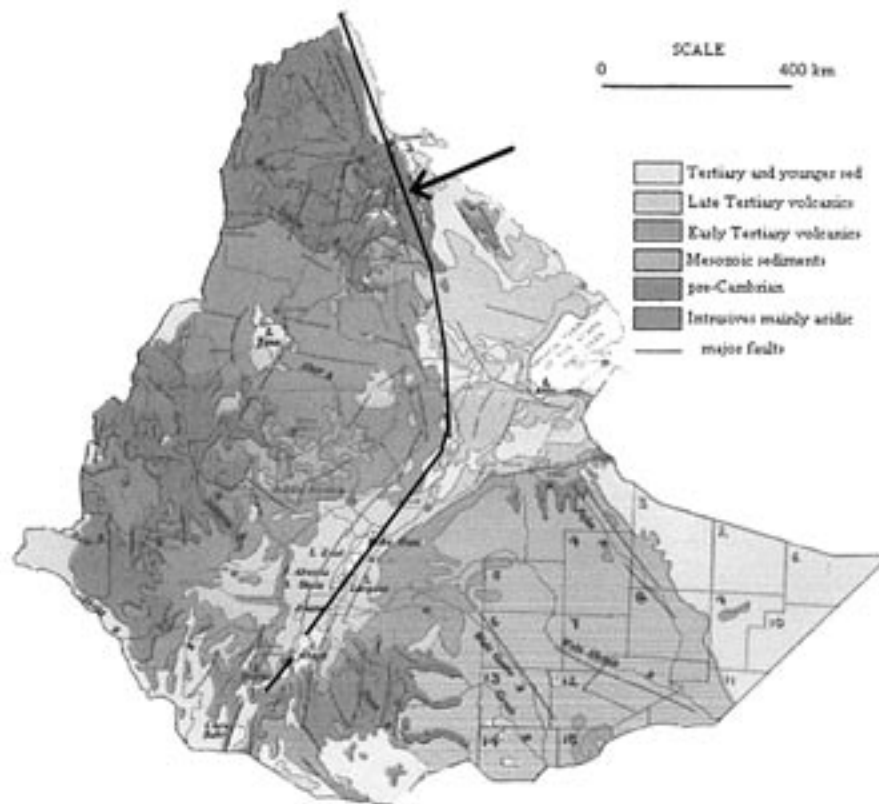


Figure 7. The geology of Ethiopia, exhibiting the Precambrian foundation of the East African Rift Valley (Black Arrow). Shown is the route of the river as it moved southwest from what is now the Red Sea (Black Line). The route to the sea was blocked by volcanic activity and the accumulation of sediment during the Tertiary (from Kazmin, 1973).

follow Precambrian faults similar to the Najd faults in northwestern Saudi Arabia (Moore, 1979; Woodmorappe, 2002). In addition, this area comprises strata from nearly every geological Paleozoic period, including the Ordovician, Silurian, and Carboniferous. Moreover, the foundations of the Red Sea and the Jordan Rift Valley, which comprises the Orontes, Litani, and Jordan rivers formed in the Precambrian. Dubertret (1970, p. 18) states that “the Red Sea structure as well as the appurtenant Dead Sea structure originated at the end of the Precambrian, as shown by many established observations.”

Beginning in the Precambrian, the Red Sea was a narrowly confined valley, which became a riverine environment, whose southerly progression moved west, forming the structure of the East African Rift Valley. This valley moved through the center of Ethiopia, forming tributaries on either side of this waterway (Figure 6). Only during the Cenozoic, in the Oligocene and Miocene, did a wider marine trough develop. Later, in the Miocene and Pliocene, the two shores began to divide, forming the new floor of what is today the Red Sea and coinciding with the accumulation of limestone, marls, clays, and evaporates (Coleman, 1994; McKenzie et al., 1970).

Of note is that the East African Rift Valley rests on a Precambrian foundation. As the shores of the Red Sea divided during the Miocene and Pliocene, Tertiary sediment and volcanic activity surmounted the Precambrian foundation of the rift valley and blocked its route to the Sea (Alene and Barker, 1993; Atnaifu and Bonavia, 1991; Kazmin, 1971; 1972a; 1972b; 1972c; 1973; 1975).

Also, the proposed origin of the Gihon is very near the modern location of the Ceyhan River in Turkey (Figure 8). It is noteworthy how similar both names appear. More remarkable is that the river was pronounced the *Jihun* or *Jechun* and was part of the ancient Hittite province of Adana. Greek civilizations

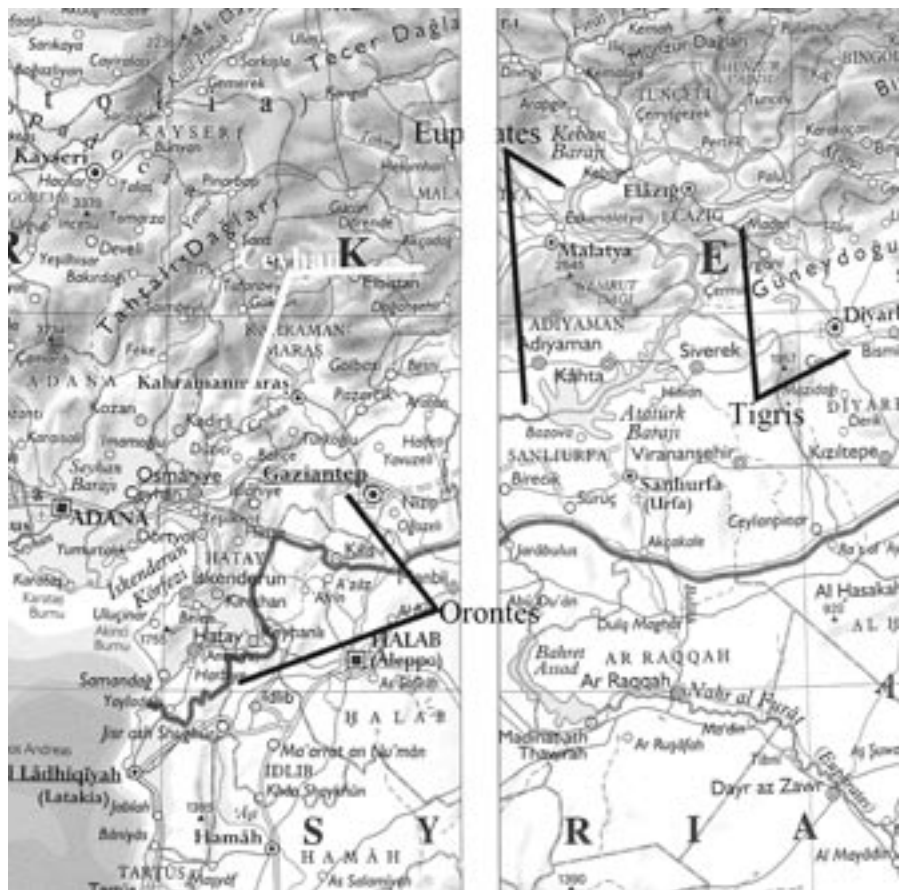


Figure 8. A map of modern Southeastern Turkey showing the origins of the Ceyhan, Orontes, Euphrates, and Tigris Rivers emerging from the same region.

called the river the Pyramus or Pyramos (Πύραμος).

Eastward

Eden also is described as located to the “east” or “eastward” in Genesis 2:8. The Biblical text seems to indicate that the direction of Eden is to the east of the author writing the text.

That the Garden of Eden was described as “to the east” or “eastward” by the author of Genesis may correlate with plate tectonics. As the Red Sea widened in the Tertiary, the Arabian plate moved north as the African plate moved south. This tectonic activity moved eastern Anatolia, the source of the Tigris, Euphrates, and the proposed Gihon and Pishon rivers, north and west over time.

Today, the Arabian plate continues to move north and west (Figure 9). For geological creationists and evolutionary geologists, Anatolia has moved north and west throughout the geological history of the earth (Baumgardner, 1990; Okay and Tuysuz, 1999). Thus, there is consensus between extremely diverse positions that early in the history of the earth eastern Anatolia was southeast of its current position. If Anatolia has moved northwest over time, Anatolia was once *east* of the Sinai Peninsula, the location where many conservative Jewish and Christian theologians state Moses authored Genesis. Hence, Eden was located toward the east.

It is noteworthy that much of the severe tectonic activity in Anatolia occurred during the Late Cretaceous and

Cenozoic Era. The Assyrian Suture, which separated the Tauride Block from the Arabian Platform, closed during the late Cenozoic. Moreover, this tectonic activity largely avoided the region of Eden. The modern city of Diyarbakir is approximately 100 kilometers south of Elazig, the center of the proposed region of Eden. Hence, the geological upheaval, between the Pontides and Tauride and Anatolide blocks, was more recent compared to geology of the region of Eden, with its Paleozoic foundation on the Arabian Platform (Figure 9).

Suggested Location of the Region of Eden

In light of the paleontological, paleobotanical, geological, and archaeological research and citations from a wide array of evolutionists and creationists, I submit the ancient location of the region of Eden was in eastern Anatolia (Figure 10). Early in Earth’s history, eastern Anatolia was east of the Sinai Peninsula, the locale where the author of Genesis wrote the first five books of the Bible. As the continents spread apart, eastern Anatolia moved northwest, away from Israel and the Sinai.

Providing additional support for Eden’s location in eastern Anatolia are textual references about the kingdom of Beth Eden or the House of Eden. According to Assyrian sources, *Bit Adini* was an Aramaean state, in the tenth century B.C., which was conquered by Assyria (Roux, 1992). That the location of Beth Eden was close to Carchemish, near eastern Anatolia, provides additional support for the association between Eden and eastern Anatolia (Figure 10).

In addition, other Biblical passages refer to Eden. In 2 Kings and Isaiah, Sennacherib’s messengers to King Hezekiah, mention a series of locales, which were conquered by Assyria before their march on Jerusalem.

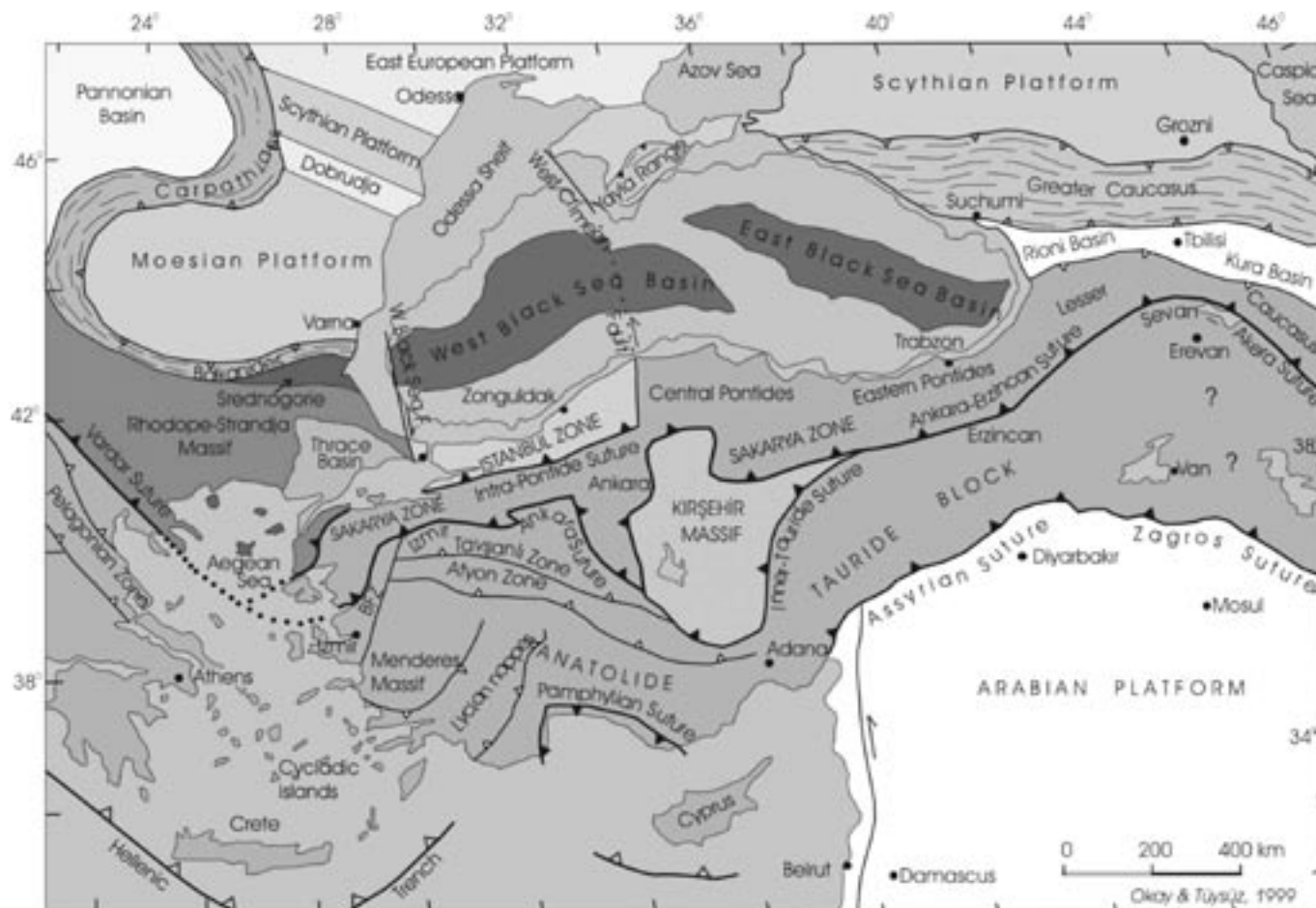


Figure 9. A tectonic map of Anatolia from Okay and Tuysuz (1999). The diagram shows the continuing pressure of the Arabian Platform against Eastern Anatolia, with the latter being pressed north and west.

Have the gods of the nations delivered them, which my fathers have destroyed, Gozan, and Haran, and Rezeph, and the sons of Eden who were in Telassar? (2 Kings 19:12).

Have the gods of the nations saved those whom my fathers have destroyed, Gozan, and Haran, and Rezeph, and the sons of Eden in Telassar? (Isa. 37:12).

With regard to the claims of Sennacherib to Hezekiah, the association between the “sons of Eden” and Gozan, Haran, and Rezeph is noteworthy. All cities are located either in eastern Anatolia or in northwestern Mesopotamia, adjacent to Anatolia. With regard to the location of Telassar, Pinches (1915, p. 2925) notes:

As Telassar was inhabited by the “children of Eden,” and is mentioned with Gozan, Haran, and Rezeph, in Western Mesopotamia, it has been suggested that it lay in Bit Adini, “the House of Adinu,” or Betheden, in the same direction, between the Euphrates and the Belikh. A place named Til-Assuri, however, is twice mentioned by Tiglath-pileser IV (Ann., 176; Slab-Inscr., II, 23), and from these passages it would seem to have lain near enough to the Assyrian border to be annexed.

The Prophet Ezekiel, in his lament for Tyre, notes that Eden traded with the doomed city.

Haran, and Canneh, and Eden; the merchants of Sheba, Asshur, Chilmad were your merchants (Ezek. 27:23).

In this passage Eden is associated with Haran. Haran is located near or in eastern Anatolia (Figure 10). To summarize, Biblical passages outside of Genesis, as well as extrabiblical texts, suggest the region of Eden was either in or near eastern Anatolia. This supports both Sanders’s (2001) and my proposed locations for Eden.

From the region of Eden emerged the four rivers of the Pishon, Gihon, Tigris, and Euphrates. The Tigris and Euphrates are evident today. The Pishon no longer exists but followed

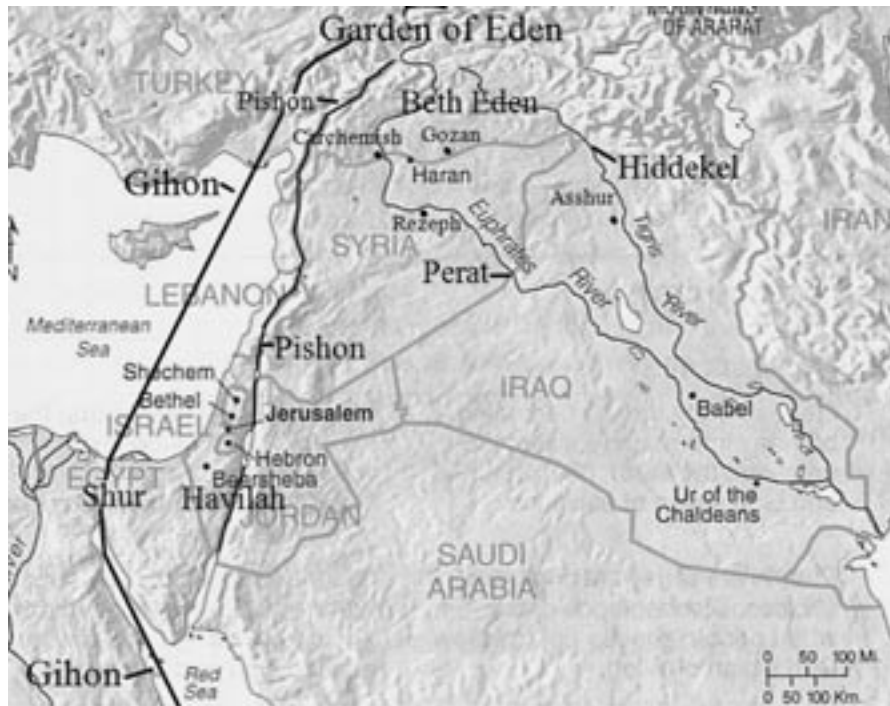


Figure 10. The suggested location of the Region of Eden, exhibiting the lands of Shur and Havilah, the ancient city of Asshur, and the routes of the Pishon, Gihon, Perat, and Hiddekel Rivers. The Perat (Euphrates) and Hiddekel (Tigris) continue today. The Pishon and Gihon halted with the expansion of the Mediterranean and Red seas, sediment accumulation, and volcanic activity, which evolutionary geologists allege occurred in the Tertiary.

the rift valley, which today comprises the Orontes, Litani, and Jordan Rivers. From the Jordan, the Pishon continued south through the once living Dead Sea to the Wadi HaArava and its tributaries, which spread throughout the land of Havilah. I suggest the ancient Gihon originated in eastern Anatolia, followed a route through what is now the eastern Mediterranean Sea, and through the western end of the Sinai Peninsula. From here the Gihon followed an ancient river, representing the modern Red Sea, which traveled west into Cush or modern Ethiopia (Figure 11).

Other Views and Discussion

In 2001, Michael Sanders proposed a location for the Garden of Eden in eastern Anatolia (Sanders, 2001). Sanders stated the source waters of the Tigris and Euphrates determined the ancient region of Eden. I disagree with his location of the *Gihon* and *Pishon* (Figure 12). For Sanders, the *Gihon* and *Pishon* were local rivers confined to eastern Anatolia. It is difficult to conceive how Sanders's thoughts regarding the *Gihon* and the *Pishon* associate with Biblical references to the lands of Havilah and Cush. Al-

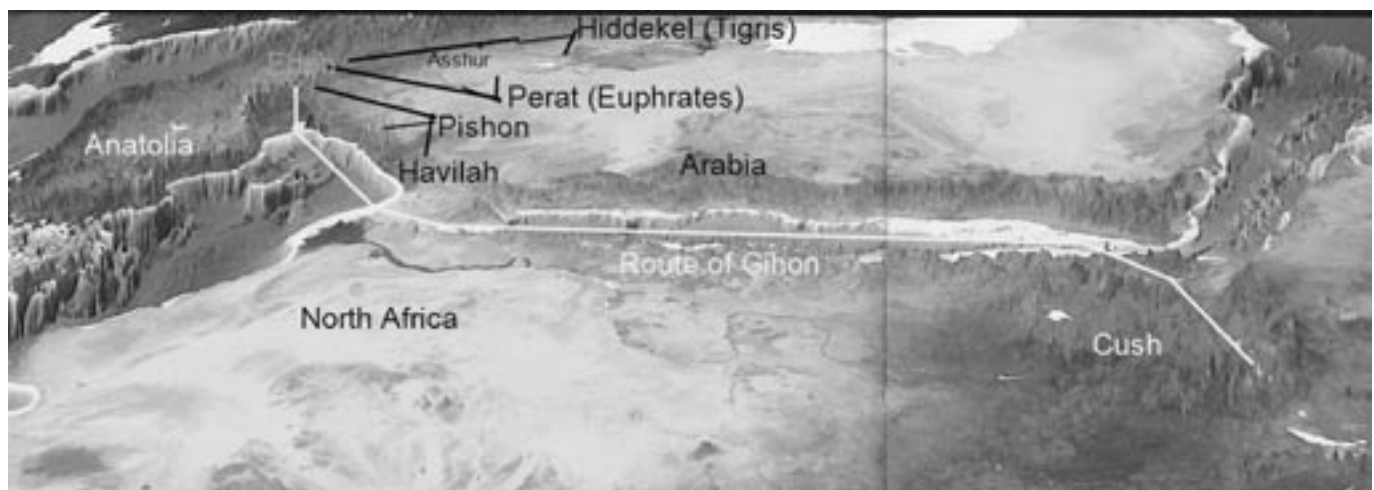


Figure 11. A satellite view of the region of Eden showing the lands of Havilah and Cush, the city of Asshur, and the routes of the Pishon, Gihon, Perat, and Hiddekel Rivers. The Perat (Euphrates) and Hiddekel (Tigris) continue today. The Pishon and Gihon do not exist today; their routes are evident by ancient rift valleys.

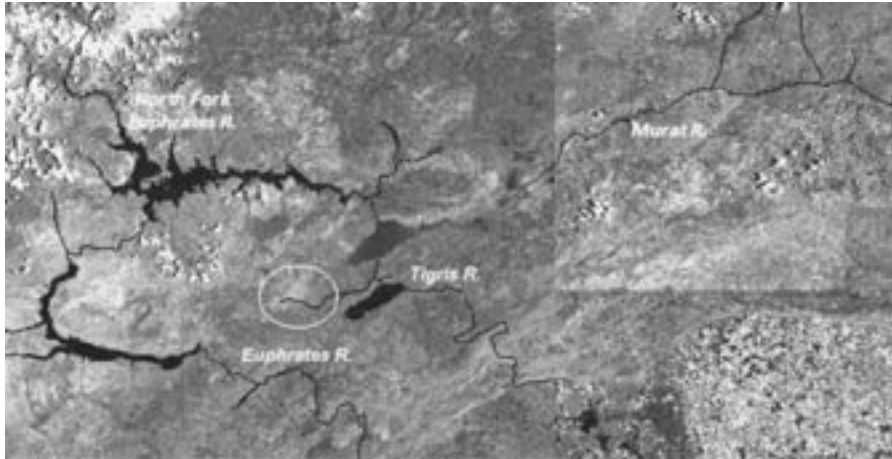


Figure 12. Satellite image of the proposed region of Eden in Eastern Anatolia (from Sanders, 2001).

though I find Sanders's locations of the *Pishon* and *Gihon* problematic, I agree with his proposed general location for Eden, in eastern Anatolia.

Recently, Jud Davis (2008) suggested that the ancient location of Eden should be associated with the current location of Jerusalem. He cites various scholars including Wenham (1986) and Tuell (2000) and ample Biblical citations (Ezek. 28:13–14; 36:22–36; 47:1–12; Pss. 46:4–5; 36:8; Isa. 33:20–21; Joel 3:18; and Zech. 14:8). However, on closer inspection, the link appears untenable. In Ezekiel 28:13–14, there seems to be a clear dichotomy between verse 13, which notes that the Devil once traveled in Eden, and verse 14, where the Evil One was also at the “holy mountain of God”—the latter possibly representing the mount of Jerusalem. In Ezekiel 36:35, the text is clear that the land of the future Messiah will be “*like* the garden of Eden” [emphasis added] but makes no connotation that Jerusalem represents the locale of ancient Eden. The remaining cited verses note two new rivers flowing from the messianic temple and no mention of an association with the ancient region of Eden. Of note, four rivers flowed from ancient Eden. To summarize, the aforementioned

Scriptures clearly state that Jerusalem and the land of the Messiah will be comparable to ancient Eden; however, there appears to be no geographical tie between ancient Eden and the current location of Jerusalem or Israel.

In 1987 Juris Zarins and Dora Hamblin suggested that Eden was located underwater, near the delta of the Tigris and Euphrates rivers (Hamblin, 1987). Using LANSAT images, Zarins equated the *Pishon* with the Wadi al-Batin, which flowed northeast from Saudi Arabia. For Zarins, the Karun River, which flowed south from mountains of Iran, represented the *Gihon* River (Figure 13). There are several problems with Zarins's theory. First, his location of Eden puts this region at the destination and not the origin of the four rivers. Zarins's theory contradicts the Bible, which clearly states that all rivers proceeded “from” and not “to” Eden. Second, it is difficult to ascertain how Zarins's location of the *Gihon* equates with Cush or how the Wadi al-Batin connects to the land of Havilah. The Bible states that Havilah is in the northeastern Sinai Peninsula, near Moab and the Kenites. Zarins's satellite images show that the Wadi al-Batin extended south, was confined to

the northeast of the Arabian Peninsula, and came nowhere near the Sinai.

Several creationists object to any potential discovery or search for the region of Eden (Hughes, 1997; Walker, 2001). Their position is that the Flood was so catastrophic that it completely changed the surface of the pre-Flood earth. For these scholars, attempting to locate Eden is an exercise in folly, because they argue that Noah and his descendants renamed all geographical locales and rivers after the floodwaters subsided. For them, all rivers and geographical locales after the Flood have no connection to features before the Flood. Walker (2001, p. 2) states, “The present Tigris and Euphrates Rivers have nothing to do with the rivers described in Genesis 2, except for their names.”

The Bible leaves little doubt that the Flood affected the surface of the earth and its geography as evidenced by 2 Peter 3:5–6, which says that God used a mighty flood to destroy the ancient world; Genesis 7:11, which says God opened the waters of the great deep; Genesis 7:19–20, which declares that the Floodwaters covered the highest mountains; and other texts that show the Flood covered the earth and extirpated all creatures with the breath of life (e.g., Genesis 7:22–23). These verses definitively counter the “gentle-flood” hypothesis proffered by some who disregard the veracity and inerrancy of Scripture and propose that the Flood was only local to the Tigris-Euphrates region (e.g., Hill, 2002). The existence of two rivers from Eden, the *Pishon* and *Gihon*, are not mentioned after the second chapter of Genesis. The Flood presumably affected these rivers, although the connection between the disappearance of these rivers and the Flood is inferred and not stated by the author of Genesis.

Many forefathers of the church, including St. Augustine and Calvin, treated the Garden of Eden as both a historical and physical reality. Alessandro Scafi notes that in the Torah “a

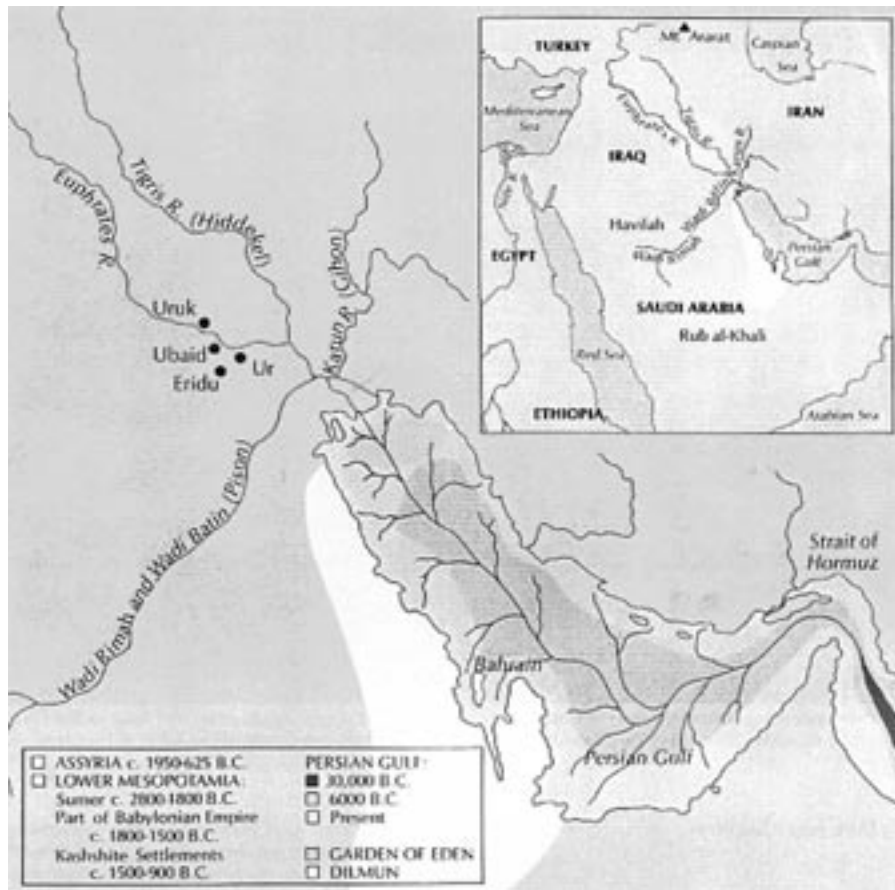


Figure 13. Hamblin and Zarins's proposed location of Eden at the end of the Tigris and Euphrates rivers (from Hamblin, 1987).

garden in Eden” is qualified by *miqedem*, a word with both spatial and temporal senses. In the Latin Vulgate, the Garden is described as *in principio* (in the beginning). In the *Glossa Ordinaria*, the Garden is *in oriente* (in the east). However, Augustine Steuchus, Calvin, Luther, and others also believed that there was some continuity in the geography of Eden, especially in the Biblical references to the Tigris and Euphrates, before and after the Flood. Hence, the veracity of Scripture depended on Eden being a historical and spatial reality, with an element of geographical continuity after the Flood (Scafi, 2006).

The argument that no geographical continuity existed before and after the Flood is questionable. The Pishon and Gihon represent the remains of rift val-

leys founded in Precambrian strata. In light of the Flood, these valleys would have provided a drainage avenue during the abative phase of the Deluge—a phase espoused by most Flood geologists, including Walker (1994). Furthermore, Woodmorappe (2002, p. 106) suggests that after the Flood, the Tigris and Euphrates rivers “reappeared at or close to” antediluvian locations as they originated on Precambrian faults whose rift structures would remain despite the deposition of flood sediment. Therefore, it seems suspect that no trace of the rivers of Eden would remain after the Flood.

Also, many creationists espouse that the Bible is the inerrant Word of God. Hence, it seems odd that Moses, the author of Genesis, would attach the name “Perat” to two waterways—before

and after the Flood, in Genesis 2:14 and 15:18—which had no geographical association (McDowell 1999; Philo 1935). On theological grounds it seems suspect that this author of the inerrant Word of God, breathed by the Holy Spirit, would apply the name “Perat” or “Hiddekel” to rivers existing before and after the Flood, which had “nothing to do” with each other.

The author of Genesis specifies that the *Hiddekel* was “the one going east of Asshur,” the ancient capital of Assyria (Gen. 2:14). It seems doubtful that Moses would describe one of the rivers from Eden (the *Hiddekel*) being “east of Asshur,” if the geographical location of this river at the time of creation had “nothing to do” with this location after the Flood.

Further, the author of Genesis describes three of the four rivers in association with post-Flood regions or a city. The *Hiddekel* is tied to the city of Asshur (Gen. 2:14). The *Pishon* is associated with the land of Havilah (Gen. 2:11). The *Gihon* is correlated with the land of Cush (Gen. 2:13). That the *Hiddekel*, *Pishon*, and *Gihon* before the Flood would have “nothing to do” with these areas after the Flood, despite Moses clearly identifying these post-Flood geographical associations, seems incongruous with Scripture.

It is a biblical fact that the Flood was universal, covered the earth, altered the geography of the earth, and dispatched all human and terrestrial animal life outside the ark. However, the argument that the Flood changed the entire surface of the pre-Flood earth, to the extent that there was no geographical continuity before and after the Flood, seems untenable. This position conflicts with the second chapter of Genesis, other Biblical passages, the Hebrew patriarchs, and the documented views of many forefathers of the Christian church.

The search for the region of Eden is a controversial but worthwhile endeavor, which has broad implications for future

research. In future research, scholars should compare the geology, fauna, flora, site formation processes, and radiometric dating, inside and outside this region.

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Book Review

A Boy Out of Time: A Time Twins Adventure

by D. B. Macks

Booklocker.com, Inc.,
248 pages, \$15.00.

Ben Javan is the 14-year-old son of archaeologists, small for his age, bullied at school and guilt-ridden over the death of his sister by drowning while he was supposed to be watching her. When his parents leave for a dig in Turkey, he gets to spend the summer with his mysterious physicist uncle who lives in an isolated area of Alaska where Ben will also get to meet a boy his own age named Seth, with whom he has been an instant messaging pen pal.

What follows is a time travel sci-fi adventure that takes the boys and the adults back to the pre-flood world where people are both technologically advanced and endowed with unusual physical and mental powers. That world is succumbing to spiritual darkness most evident in the Nephilim.

Promotion of moral courage, commitment to biblical accuracy, awareness of spiritual warfare, and development of

interesting protagonists take place in a world that has flavors of Narnia, Middle Earth, and the realm of Darth Vader. The story just might be a reasonable guess at that real antediluvian history that is only summarized in Genesis. Intended as the kick-off of a series, this book stands a chance of dragging kids away from their video games.

Ross S. Olson, M.D.

Provenance Studies of Clastic Sediments and Their Role in a Hydrodynamic Interpretation of the Genesis Flood

John K. Reed and Carl R. Froede Jr.*

Abstract

Studies tracing sedimentary particles to their source, referred to by geologists as provenance studies, can play an important role in the hydrodynamic approach to interpreting the rock record. This methodology is superior to the entrenched uniformitarian time-stratigraphic method, which filters interpretation through its geologic column because it 1) resolves presuppositional contradictions between the column and biblical history and 2) provides a sounder empirical foundation for interpretation. Ultimately, the hydrodynamic method could yield 3-D models of the flow regime of the Flood, calibrated to abundant forensic sedimentologic data. Though such models are not presently realistic, the empirical work necessary to support them can be done by the collection of local flow regime information from crustal sediments. Any future model will require calibration to flow information, which must be derived from sedimentological data—such as provenance studies. Examples of such studies suggest interesting lines of inquiry into non-uniformitarian alternatives and demonstrate additional shortcomings of the time-stratigraphic approach.

Introduction

The birth of modern stratigraphy began in the 1600s with the work of Nicolas Steno, who based interpretation on chronological relationships between vertically adjacent sedimentary layers. This was a rational approach for the time—layers are easily observed in the field and the scientific and technological

tools for more sophisticated analysis did not exist. Unfortunately, the time-stratigraphic paradigm diverged from, and outlasted, Steno's empirical emphasis (Berthault, 2004; Julien et al., 1993; 1994; Reed et al., 2006).

This unfortunate situation can be laid at the feet of early nineteenth-century uniformitarianism and its emphasis

on defining prehistory by geologic time periods. The mania to pigeonhole rocks into prehistoric time periods blinded many geologists to all but bedding boundaries and the newly minted divisions of the geologic timescale. Belatedly, we are now realizing that Lyell and his peers erred in two fundamental ways. First, their strict uniformitarianism has not been able to explain the rock record, hence the recent advent of neocatastrophism. Second, they subordinated empirical science in their quest to displace biblical history with secular prehistory. When push came to shove, they

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maintained the preeminence of their philosophical uniformitarianism over empiricism. As a result, geologic history has become increasingly divorced from the empirical method. This has resulted in an internal tension within geology between empirical observation and the time-stratigraphic framework of natural history (Ager, 1993a; 1993b).

The time-stratigraphic approach is being challenged on a more fundamen-

tal level by some diluvialists—by presuppositional critiques (Reed, 2001; 2008a; 2008b) and experimental data (Berthault, 2002; Julien et al., 1993; 1994). The way is being paved for an alternative—and more empirical—method of investigating the rock record. This new method is that of paleohydraulic reconstruction from sedimentologic data.

Some diluvial studies have been conducted along these lines (Table

I), applying experimentally derived thresholds for erosion and deposition to field-measurable parameters such as grain size, bedding, and sedimentary structures. Tools developed by uniformitarian sedimentology, such as paleocurrent analysis and provenance studies, fit well within this method, but the uniformitarians stop short of using the full potential of these empirical studies because they limit themselves by the walls of their time-stratigraphic shibboleth—the geological timescale.

However, diluvialists understand that if the rock record is largely the result of the Genesis Flood, it is a reasonable strategy of forensic natural history to attempt to derive the three-dimensional hydraulic flow regime of the Flood over its 371-day duration. This is a daunting task, if for no other reason than its scale. Yet it is a worthy goal, because ironically it could provide the most *scientific* interpretation of the rock record.

Approximation of the Flood's paleohydrology can be derived by two complementary methods: (1) forensic examination of preserved flow indicators (such as grain size or cross-bedding) in the rock record, and (2) numerical modeling of three-dimensional hydraulic flow nets using varied sets of proposed parameters. In the best of all possible worlds, modelers and sedimentologists would work together to integrate modeling with forensic sedimentology. At present, there have only been two published numerical modeling solutions (Barnette and Baumgardner, 1994; Prabhu et al., 2008), and neither appears to have made any attempt to incorporate sedimentological data.

However, vast amounts of paleocurrent data exist in the geological literature, and the theoretical foundations for interpreting sedimentary observations are available, though sadly underutilized (cf. Julien, 1995; Pye, 1994). To be of use to diluvialists, these field data must be excised of all aspects of their uniformitarian interpretation. That bias exists to

Table I. Paleohydraulic Approach

Author	Summary of Work
Allen, 1996	Hawkesbury Sandstone of southeastern Australia - depositional constraints. Much background info.
Austin, 2003	Catastrophic deposition of Redwall Limestone member demanded by nautiloid graveyard
Berthault, 2004	Tonto Group (Tapeats SS, Bright Angel Sh, Mauv LS) of Grand Canyon interpreted as single deposit
Froede, 2004	Traced siliciclastics from the Appalachians to the Navajo Sandstone.
Froede, 2006	Traced pebbles and sands down the length of the Florida peninsula.
Howe and Froede, 1999	Traced distant origin of cobbles and boulders in the Marathon Basin, Texas.
Lalomov, 2001; 2003	Tavrick and Demerdji formations of Crimea show rapid deposition; transport from Ukraine
Lalomov et al., 2006	Cambro-Ordovician clastics near St. Petersburg were deposited rapidly as one sequence; erosion surfaces show variations in flow, not time.
Lalomov, 2007	Grain size analysis shows that Crimean Jurassic sediments formed catastrophically.
Oard and Klevberg, 1998	Cyprus Hills Gravel shows large, Flood currents carrying boulders, cobbles hundreds of miles.
Oard and Klevberg, 2005	Rim Gravels in Arizona show transport prior to erosion of central AZ south of Mogollon Rim.
Oard, 2008	Nenana Gravels deposited as Alaska Range is uplifted in late Flood receding currents
Sigler and Wingerden, 1998	Catastrophic origin of Kingston Peak Formation, Mojave Desert, California
Snelling, 2008	Addressed possibility of Appalachian origin for western sandstones.

multiple levels, since presuppositions often drive conclusions that then become the foundation for additional theorizing. Some—like conclusions based on the timescale—are easily detected, but others are not. However, the goal of deriving floodwater flow regimes deserves the best efforts by diluvialists.

One area of forensic sedimentology that may prove helpful for providing coarse flow directions, as well as transport distance and current dimension, is that of provenance studies. These provide an origin point for transport, which in turn suggests flow paths, current dimension, and flow velocity, providing a good approximation of transport that can be refined by more detailed studies and models. If it is possible to track a sedimentary clast from its origin, through its transport, and to its depositional and postdepositional fate, then a viable hydrodynamic reconstruction should also be possible.

But before we address these studies, we must first examine the present state of modeling the hydrodynamic flow regime of the Flood.

Limits of Modeling

Numerical modeling is a relatively recent tool that is beginning to come into its own, thanks to exponential leaps in computing power. Predictive models based on sound hydraulic engineering principles have been developed for other areas, especially in the atmospheric and groundwater sciences. At present, there is still a significant tradeoff between scale and detail. Clearly the best models are those that are able to incorporate the most parameters and be well calibrated to field observations.

Diluvial flow models are rare; at present only two numerical models of Flood flow patterns exist—those of Barnette and Baumgardner (1994) and of Prabhu et al. (2008). Although both models address global conditions, both are very coarse 2-D models, quite limited in their

assumptions and parameterization. Neither model was calibrated to quantitative field data. Despite these shortcomings, both represent a start in a promising area of research. Both provide initial qualitative and conceptual flow patterns that might be helpful on a very gross scale. Apparent local discrepancies—both empirical and conceptual—are part and parcel of the limits of these models.

Thus, diluvialists should be cautious in applying their results to specific field studies. At best, both assume initial conditions more conducive to the middle of the Flood because of their use of the Pangean “supercontinent.” Both are forced to ignore numerous hydraulic factors undoubtedly determinative of the actual flow regime, such as vertical flow gradients; the effects of turbulent flow; pressure, temperature, and density gradients; and chemical properties of water that might affect flow properties. Likewise, geologic factors that would influence flow, such as uplift and downwarping, were not incorporated. Neither could present an explanation of Flood flow conditions at its onset, which would naturally have exerted a profound influence on subsequent flow conditions. Furthermore, the Bible, in Psalm 104:5–9, suggests that the late Flood drainage off the continents resulted from large vertical changes in the relative elevations of both continents and oceans. These changes would profoundly affect a global flow regime; likely decreasing the velocity of the currents where they flowed off the continents into the deepening ocean basins. This would affect flow inland, as would changing base levels and any local tectonic uplift or downwarping.

We must be careful when calibrating numerical models to the rock record because the relative timing of distinct Flood stages cannot easily be located in the rock record, especially when using the questionable chronostratigraphy of the geologic column. It is imperative to understand that the hydrodynamic

approach is not intended to supplement the time-stratigraphic approach—it is meant to displace it.

Given these limitations, it is clear that numerical computer models will be most effective when they incorporate the hard realities of the rock record through forensic sedimentology. This is fortunate in one sense: although the models are difficult to construct and run and require rare skills and resources, the work needed to supply data for their calibration is not. Advanced forensic sedimentology can be performed by a broader group of diluvialists. In many cases, it merely involves literature research, extracting the raw data collected for years by uniformitarian researchers. Thus it appears that the present emphasis should be on finding and publishing the flow properties from the rock record. This approach has been successfully applied by diluvialists (Table I). Lalomov et al (2006), who used their own field measurements, demonstrated that even the duration of sedimentation (using minimum experimental thresholds) can be estimated from this type of paleohydraulic analysis—an important component of any model.

Another reason to merge forensic sedimentology with the models is to calibrate modeled flow regimes that may be contrary to field data. For example, Barnette and Baumgardner (1994) showed the rapid establishment of large-scale hydrodynamic gyres on flooded continents. In North America, these gyres were shown to create a counterclockwise flow, increasing in velocity in the northern latitudes. Creationists might be tempted to use that study to support flow directions during the Flood (e.g., Oard, 2008b). That would be premature, given the limited parameters included in that study, and the near certainty of local variations over both time and space in the hydraulic regime, such as topography, tectonics, and vertical flow components of upwelling waters and downwelling density currents.

So at present we are left with several needs: 1) collecting and cataloging field data indicating past flow regimes, 2) building more sophisticated models, and 3) integrating the results. It may be necessary to restrict the scale of initial models to more successfully integrate field data, scaling up as these models prove their ability to explain and predict sedimentological information. Models also should consider the various stages of the Flood and their effects on flow regimes. One way to do so would be to apply paleocurrent indicators, which have the advantage of being plentiful in the literature. Another method, and perhaps one that will be more congenial to continent-scale models, is the determination of sedimentary provenance—the origin of particles in sedimentary formations. For example, these studies suggest that physical forces other than the Coriolis effect were important factors in erosion and deposition during the Flood. Sediment distribution patterns also might demonstrate whether or not the counterclockwise, regional-scale gyres of Barnette and Baumgardner's (1994) model really existed. Future models can then attempt to include the field-derived flow regimes at various locations, providing they can match the Flood stage during which these flows occurred. Obviously, this would be most accurately done for the times near the end of the Flood.

Information from Provenance Studies

Sources of the particles that make up sedimentary deposits have been of interest to sedimentologists for decades (cf. Pettijohn, 1975, chapter 13; Pettijohn et al., 1987, chapter 7). These studies are not always easy—the bulk of clastic sediments are quartz, feldspar, and mica; which are seldom sufficiently unique enough to specify a single source location. Other complications include multiple source areas for the same formation and changes in sediment composition

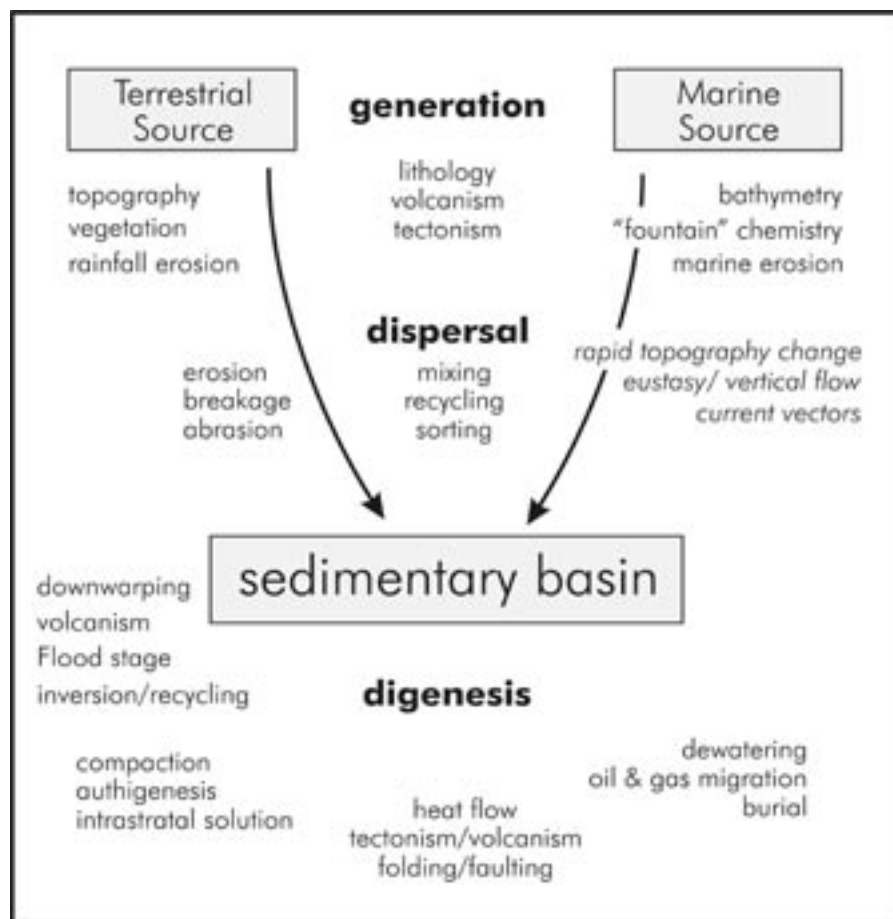


Figure 1. The study of sedimentary provenance attempts to track the changes that occur in sedimentary grains from their initial source to their final depositional location, as well as those that occur after deposition. The multitude of physical processes in the Flood that would have affected this cycle shows the challenges to provenance studies. Modified from Weltje and von Eynatten (2004).

that can occur during transport, deposition, and diagenesis (Figure 1).

However, these problems can be circumvented by examining ratios of these minerals, suites of heavy minerals, and unique individual clasts (e.g., Howe and Froede, 1999; Lalomov, 2007; Oard et al., 2007). Furthermore, sedimentologists in recent years have developed sophisticated quantitative methods for measuring provenance.

The intent of sedimentary provenance studies is to reconstruct and to interpret the history of sediment from the initial erosion of parent rocks to the final burial of their

detritus, i.e., to unravel the line of descent or lineage of the sediment under investigation (Weltje and von Eynatten, 2004, p. 2).

These types of studies can be traced back to the nineteenth century, when the first efforts focused on tracing heavy minerals back to their parent rocks, based on the assumption of unique percentages of such minerals in igneous and metamorphic suites. The development of sedimentary petrography and methods such as counting grains in thin sections broadened the ways in which provenance could be investigated. These led to the inclusion of bulk sedimentary



Figure 2. Dark heavy-mineral sands occur in areas along the Gulf-facing beach at Dauphin Island, Alabama. The heavy mineral suite originated in the southern Appalachian Mountains and consists of ilmenite, kyanite, staurolite, leucoxene, tourmaline, zircon, rutile, sillimanite, and hornblende (Simonson, 1983).

composition in provenance determination and the famous mid-twentieth-century sandstone classification schemes. The late twentieth century saw an increasing focus on quantitative approaches to provenance studies through complex equations and the use of computer models of basin evolution. Many of these studies focus on the tectonic influence of developing “petrofacies” in particular areas. More detailed information can be found in *Sedimentary Geology* (Volume 171; 2004), which was dedicated to provenance analysis.

Unfortunately, uniformitarian assumptions permeate this field: a philosophical commitment to prehistory and deep time, purported similarities between modern and ancient environments, the rejection of catastrophism, and the ongoing motion of tectonic plates.

In spite of the development of sophisticated quantitative provenance studies, practical uses of qualitative studies abound. Many of these are use-

ful for those interested in hydrodynamic modeling of the Flood, providing constraints on current direction, distance, and duration. For example, sediments eroded from multiple source areas can vary in their ratios of kyanite, staurolite, and sillimanite, and these different ratios have been used to identify probable sediment source areas across the United States Gulf Coastal Plain (e.g., van Andel, 1960; Mange and Otvos, 2005). Across this same area, heavy minerals (garnet, zircon, ilmenite, pyroxene, amphibole, epidote, tourmaline, magnetite, and rutile) also have proven useful in provenance studies (Carver, 1986; Dickinson, 1985; Dickinson and Suczek, 1979; Oivanki, 1994; Sabeen et al., 2002; Simonson, 1983) (Figure 2). As long as creationists beware of improper assumptions, such as provenance studies using fossil suites based on evolutionary progression or those relying on radiometric age-dating techniques (Oard, in press), many published studies can be useful. We can extract the raw data from

uniformitarian studies to provide coarse paleohydrodynamic information in a diluvial setting. Several examples are presented to illustrate how provenance studies can constrain diluvial interpretation (Figure 3).

- A. Navajo Sandstone and Coconino Sandstone—Utah/Arizona.** Recent provenance studies of the Navajo and Coconino sandstones suggest that they were derived from the uplifted Appalachian Mountains (Dickinson and Gehrels, 2009). Since these sandstones are located on the western side of the Rocky Mountains, they constrain the relative timing of uplift for the Appalachian and Rocky Mountains. This also suggests two further points of interest for diluvialists: that during this time, floodwater flowed in an east-to-west direction, and that currents were large enough to transport sediments several thousand km (Froede, 2004; Snelling, 2008). Similar studies of other sedimentary units can help us understand tectonism and hydraulic Flood regimes in other places and for other times during the Flood.
- B. Norphlet Sandstone—Southwestern Alabama.** A provenance study of the mineral suite within this deeply buried sandstone indicates that it was derived from the southern Appalachian Mountains located to the east (Ryan et al., 1987). Thus flow during the transport of the Norphlet sands was to the south, southwest, and was of regional extent.
- C. Upper Pliocene siliciclastics—Florida.** Quartz sands and quartzite pebbles found down the length of the Florida peninsula were derived from the southern Appalachian Mountains (Hine et al., 2009; Warzeski et al., 1996). This indicates that during the late stages of the Flood, north-to-south currents existed in the southeastern USA region, transporting siliciclastic sediments over hundreds

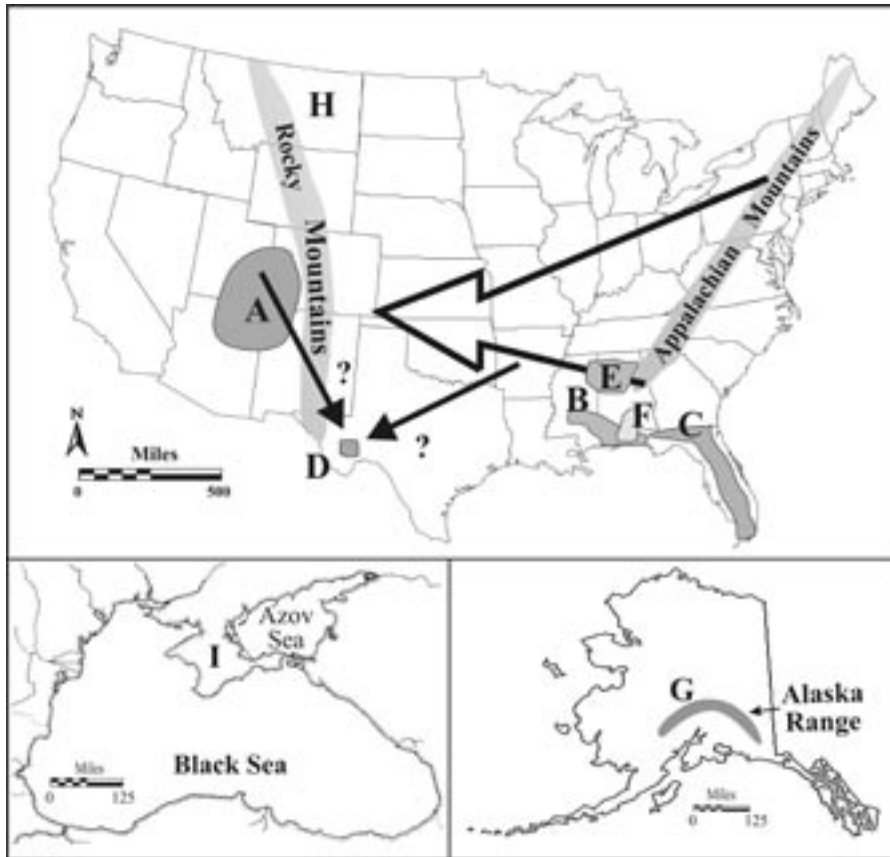


Figure 3. Several provenance studies—most across the continental United States—suggest a complex source-deposit relationship during the Flood. The large letters correspond to the locations discussed in the text: (A) Navajo/Coconino Sandstone, (B) Norphlet Sandstone, (C) Florida Upper Pliocene siliciclastics, (D) Haymond Boulder Beds, (E) Hartselle Sandstone, (F) Alabama Miocene deposits, (G) Nenana Gravels, (H) Cyprus Hills Gravel, and (I) Demerdji Formation. Note that some transport pathways are general and tentative.

of miles—all the way to the Florida Keys (Froede, 2006) (Figure 4).

D. Haymond Formation Boulder Beds—Marathon, Texas. A study of the provenance of the boulders found within this formation indicates multiple source areas ranging from 125 miles to the southeast, or possibly Utah (northwest), or even farther to source rocks in the southern Appalachians (Howe and Froede, 1999) (Figure 5). This indicates multiple flow paths operating north-to-south, south-to-north, and east-to-west, depending on the ultimate source of the boulders. This

shows the potential complexity of the hydrodynamic regime of the Flood. It also constrains the timing of orogenies; if the fossil-bearing boulders were derived from Utah, then they were likely transported to the Marathon Basin *before* the Rocky Mountains were uplifted. None of the boulder transport currents are consistent with the simple gyres predicted by Barnette and Baumgardner (1994), illustrating the complexity over both time and space of flow within the Flood.

E. Hartselle Sandstone—Northeastern Alabama. A provenance study



Figure 4. These quartz pebbles were eroded from metamorphic vein quartz in the southern Appalachian Mountains and transported south to near Lake Okeechobee, Florida—approximately 550 miles. The anticipated flow velocity and transport distance necessary to erode and move these clasts is consistent with currents expected in the Flood (Froede, 2006).

was conducted on the Hartselle Sandstone (Mississippian) in the Appalachian fold and thrust belt in northeastern Alabama. The study revealed that the sandstone originated from low-rank metamorphic source rocks derived from the unroofing of the southern Appalachians (Mack et al., 1981). Again, the study indicates southwest flow over hundreds of miles.

F. Miocene Clastics—Alabama Gulf Coastal Plain. A provenance study on the sands indicates that they were derived from the southern Appalachian Mountains (Isphording, 1977) and transported southward during the late stages of the Flood.

G. Nenana Gravels—Alaska. These sedimentary units north of the Alaska Range were derived from rocks south of range mountains prior to uplift and then from the rising peaks as the Alaska Range was



Figure 5. Large boulders in this exposed road cut in the Marathon Basin, Texas, were derived from multiple source areas—none of which are readily explained by uniformitarian models. The long-distance transport of such large clasts is consistent with the Flood (Howe and Froede, 1999).



Figure 6. Nenana Gravels derived from Alaska Range. Large, high-velocity currents would have been needed to move these gravels, again consistent with the Flood. From Oard (2008a).



Figure 7. Cyprus Hills Gravels, including this cobble, were eroded from outcrops in Idaho and Montana and then transported hundreds of miles by fast-moving Flood currents. The extreme current velocity is also demonstrated by the percussion marks on the resistant quartzite clasts, caused by impacts from other rocks. Photo courtesy of M.J. Oard.

uplifted (Oard, 2008a) (Figure 6).

- H. **Cyprus Hills Gravel—Northern Rocky Mountains.** Well-rounded cobbles and boulders were transported hundreds of miles from their sources in Montana and Idaho by powerful and widespread currents (Figure 7). The location of the source area for these gravels indicates that transport preceded uplift of the present continental divide (Oard and Klevberg, 1998).
- I. **Demerdji Formation—Crimean Peninsula.** Gravels of the Demerdji Formation contain exotics transported up to 250 miles south from the Ukrainian Crystalline Massif (Lalomov, 2003).

Conclusions

The pioneers of modern geology chose to build their discipline around the fundamental paradigm of the time-stratigraphic analysis of the rock record. This entailed a philosophically rigorous view of uniformitarianism that is no

longer viable. Given its obvious failures, another way of looking at the rock record is clearly needed, and the hydrodynamic approach offers many advantages—not the least of which is its comparatively robust empirical method. Diluvialists face a clear incompatibility between the time-stratigraphic method (and its derivative geologic column) and diluvial geology (Berthault, 2002; Froede, 2007; Reed, 2008a; 2008b; 2008c).

We suggest that the rock record, which appears so puzzling in terms of biblical history when forced into the framework of the geologic timescale, would be better understood if interpreted by means of a hydraulic evaluation of sedimentary composition and bedding. The ultimate goal of this revolutionary method would be the reconstruction of the Flood's hydrodynamic flow regime throughout its 371-day duration over the entire globe. This will demand numerical models currently beyond today's technology. A start in this direction has been made with the models presented by Barnette and Baumgardner (1994) and by Prabhu et al. (2008). However, we caution that any successful model must include the vital step of calibration to forensic sedimentologic data, and we further suggest that the task of collecting and cataloging such data become a primary focus of diluvial geologists. Even before these models are constructed, the qualitative and quantitative information provided by sedimentological data, especially those derived from rigorous provenance studies, should prove useful in determining paleocurrent vectors that can physically constrain the conceptual depositional flow regime of the Genesis Flood on a local to regional scale.

As such studies proceed, we should expect local to regional scale complexity in defining various flow regimes, given the multiple overlapping parameters; and we should beware confusion in the dimension of time, given the likely inapplicability of the geologic timescale (even in its relative chronostratigraphy)

to the rock record. Yet the goal of understanding the flow regime of the Flood, perhaps even on a global scale, is certainly sufficient motivation to pursue these studies, at present, primarily through forensic field evidence.

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Book Review

The New Creationism

by Paul Garner

Evangelical Press, Webster, NY,
2009, 304 pp, \$16.00.

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In 1982, the book *What Is Creation Science?* (WCS) by Henry M. Morris and Gary E. Parker appeared. It endeavored to explain a much-generalized scientific creation worldview to a lay audience. Parker, a biologist, wrote the first part dealing with the life sciences, and Morris, a hydraulics engineer, scribed the section on the physical sciences. This book presented the case for creation without reference to Biblical arguments and citations.

At that time, the Institute for Creation Research (ICR) was promoting its two-model approach, which compared and contrasted the evidence for the creation and evolution models of origins. WCS and the earlier, more technical *Scientific Creationism* (1974) were published years before the rise of the intelligent design (ID) movement. ICR's two-model approach and ID both strove to decouple Biblical bias from their creation/design arguments. WCS is filled with quotes of evolutionists who themselves point out the weaknesses of their theory. These quotations and resulting discussions were made to show the merits of the creation model from a strictly scientific perspective and to allow for a wider readership by secular audiences. While much in the earlier volume is similar to Paul Gardner's *The New Creationism* (TNC), there is a significant difference in emphasis.

TNC is specifically geared to the Christian market and includes many Biblical references as it sets forth the view of origins emphasizing the Creation, the Fall, the Flood, and post-Flood eras. TNC is written in a lay-friendly manner; and while confrontation with evolutionary theory is inevitable, it is de-emphasized in favor of establishing a Biblical creation overview. Garner writes, "In this book, I will, where necessary, offer criticisms of conventional theories; however, my main aim is to summarize the work of modern-day scholars who are seeking to restore the Biblical foundations of the scientific enterprise and build positive creationist theories in the field of origins" (p. 15).

What are some of the differences between these two books? In the Morris and Parker book, much space is given to the importance of the second law of thermodynamics as a major hindrance to macroevolutionary theory (WCS, pp. 156-188), while in *The New Creationism* the "law of entropy" is mentioned just once (p. 37). TNC does strongly present the importance of the Curse (Genesis 3) on creation (pp. 155-164). Unlike WCS, Garner's book cites not just recent creation research unavailable in 1982 but also details very specific creation theories that can be confirmed or falsified. It discusses the time dilation theory of Russell Humphreys, catastrophic plate tectonics, RATE research, Kurt Wise's floating forest ideas, Michael Oard's Ice Age studies, the growing discipline of

baraminology, and many other innovative creation concepts. Garner believes these are the most promising of recent creation proposals. He wisely cautions, "Although I have tried to summarize what I regard as the best research at the time of writing, not all the ideas in this book will stand the test of time. Some of these theories will have to be revised or abandoned while Scripture remains true for all time" (p. 16).

TNC starts with cosmological questions about the big bang theory and proceeds to the formation of galaxies, stars, the solar system, and Earth. It discusses the issue of the Biblical time frame versus the deep-time paradigm of the secular science establishment with critiques of radiometric dating, origin-of-life studies, uniformitarianism, and evolution evidences. The book includes Flood catastrophism, the fossil record, post-Flood events such as the Ice Age, the distribution of mankind, the origin of races, and other issues.

Garner holds advanced degrees in both biology and geology and writes in a very clear style that nonprofessional readers will appreciate. This volume is a good introduction to current creation thinking. It has numerous helpful diagrams and illustrations, a bibliography, Web site listings, an index, extensive endnotes, and numerous commendations.

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The Evolution of Dinosaurs: Much Conjecture, Little Evidence

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Abstract

The evidence for dinosaur evolution was reviewed, along with the various theories of dinosaur evolution and the evidence for their support. Dinosaurs are commonly believed to have evolved from a small, crocodile-like animal; however, a review of the known fossils provides no evidence for dinosaur evolution from non-dinosaurs, despite the excellent and abundant dinosaur fossil record. This finding is very significant because the bones of many of the average- to larger-sized dinosaurs discovered to date are usually fairly well preserved due to their large size and thickness. Dinosaurs appear abruptly in the fossil record and disappear just as suddenly. The fossil findings for several major dinosaur species also were reviewed.

Introduction

Dinosaurs are “astonishing animals” that are a major topic of both popular interest and scientific study (Weishampel et. al, 2007, p. 7). The discovery of dinosaurs in the early 1800s radically challenged our view of the world, especially our view of the past (Croft, 1982, p. 12). Their study is an ideal area to evaluate evolution because an enormous amount of excellent fossil evidence exists. One reason for the excellent fossil record of dinosaurs is that their fossils are preserved better than those of most other animals (such as the smaller, hollow-boned birds) due to the dinosaur’s large size and thick bones.

So far, based on the many thousands of nearly complete skeletons, plus multi-thousands of partially complete skeletons, around 400 to 700 different dinosaur species have been identified (Novacek, 1996). Furthermore, a large collection of teeth and even some soft tissues have been preserved (Hwang, 2005; Lingham-Soliar, 2008). Since abundant fossil evidence exists, if dinosaurs evolved from some primitive precursor, good fossil evidence for their evolution from their earlier ancestors should have been uncovered by now. However, the extant fossil evidence does not support their evolution from lower forms of life.

The popular meaning of the term “dinosaur” is “terrible lizard” because of their size and assumed ferociousness. They were all terrestrial reptiles—members of the archosauria clade that had scaly skin and hatched their young from eggs. A few were enormous in size, but most were around the size of bulls, and a few were as small as chickens. Dinosaurs were not only huge, but they also “were the first land animals ... designed for speed and agility” (Haines, 1999, p. 14). Most were excellent runners on land, mostly up on their toes due to their hip and ankle construction.

Yet, in spite of the abundant fossil record, our “knowledge of dinosaurs is very fragmentary and much that has been written remains speculation,” and “many authors have failed to differentiate between speculation and fact” (Croft, 1982, p. 9). Although much has been learned since these words were

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written, it is still true that we know comparatively little about dinosaurs, partly because most of our knowledge is based on footprints, bones, teeth, and a few body parts such as scales. These parts make up only about ten percent of the animal (Croft, 1982). The many major unknowns include their specific diet (although, judging on structures such as teeth, most types are classified as herbivores or carnivores) and whether they were ectotherms, or cold-blooded (the common view in the past), or endotherms, warm-blooded (the view that much accumulated evidence supports) (ex. DeYoung, 2000, pp. 94–98).

Dinosaur Taxonomy

Dinosaurs are part of the archosauria (ancient lizard) clade that includes thecodontians saurischians, ornithischians, crocodilians, and the flying pterosaurs (Weishampel et. al, 2007). The only members of the archosauria clade still alive today are crocodiles and alligators (Parker, 2000). Dinosauria is divided into two significantly distinct dinosaur families, those with birdlike hips that point downward and toward the tail, the *ornithischians*, and those with lizardlike hips that point downward and to the front, the *saurischians*. The saurischians include some small, slightly built reptiles and others that are large fierce animals believed to have evolved before dinosaurs. So far, all “attempts to relate these two types of dinosaurs to the Triassic pseudosuchians” are problematic because “there appears to be a puzzling overlap in time between the two groups,” and, so far, “possible evolutionary links between them obstinately refuse to appear” (Cox, 1976, p. 314).

The saurischia are divided into the *theropods* (beast feet), which walked on two three-toed birdlike feet with sharp claws, and the *sauroopods* (lizard feet), which walked on four feet and had small heads, long necks, and bulky bodies such as *apatosaurs* (Cranfield, 2002). The or-

nithischians were a very large and varied group (Parker, 2000). This classification also has come under fire. Forster (2000, 46) wrote that “most paleontologists now feel that we simply need to stop considering the Dinosauria as being composed of only the Saurischia and Ornithischia.” Among the reasons is that paleontologists know almost nothing “about the early evolution of these creatures, and in particular, the evolution of the dinosaurs before the saurishian-ornithischian split” (Forster, 2000, p. 46). The taxonomy in paleontology that formed the basis of modern taxonomy was problematic from the beginning of the discovery of dinosaurs.

As E.D. Cope and O.C. Marsh vied for the glory of finding spectacular dinosaurs and mammals in the American West, they fell into a pattern of rush and superficiality born of their intense competition and mutual dislike. Both wanted to bag as many names as possible, so they published too quickly, often with inadequate descriptions, careless study, and poor illustrations. In this unseemly rush, they frequently gave names to fragmentary material that could not be well characterized and sometimes described the same creature twice by failing to make proper distinctions among the fragments ... both Cope and Marsh often described and officially named a species when only a few bones had been excavated and most of the skeleton remained in the ground (Gould, 1991, p. 87).

In spite of years of intensive effort, major disagreement still exists among the experts on dinosaur classification, which is one reason why determining their phylogeny is so difficult for paleontologists. The most recent taxonomy proposal is not based on evolution or fossil trees but cladistic analysis using 107 anatomical traits (Weishampel et. al, 2007). The fact is, how “closely related one fossil animal is to another is very

much a matter of opinion” (Horner and Lessem, 1993 , p.128), and this is one reason why so much disagreement exists about their phylogeny. Another problem is about half of all putative species are known only by “a few teeth or bone scraps” (Horner and Lessem, 1993, p. 128).

The Origin of Dinosaurs

Dinosaurs were abundant in number and variety around the world by the Late Triassic (Forster, 2000, p. 49). Their variety and abundance coupled with a lack of any empirical evidence for their evolution has resulted in many phylogeny proposals. One of the most common phylogeny theories today is that dinosaurs evolved from an alligator-like reptile. Haines (1999) wrote that there is still much

controversy about how and when dinosaurs evolved. But the most popular current theory has dinosaurs first appearing as small, two-legged carnivores in the mid-Triassic, around 235 million years ago with a combination of features that marked them as different (p. 14).

The Archosauria reptiles (from which some believe the dinosaurs have descended) are thecodonts that first appeared in the fossil record during the Triassic (Benton, 1984). Thecodonts, a term meaning “socket-toothed,” were large, heavy crocodile-like animals that crawled low to the ground and on all four legs. They had long jaws and tails similar to crocodiles, and for this reason some argue that they were only a type of primitive crocodile.

Other experts argue that thecodonts were an offshoot or branch of the line that led to the dinosaurs. The theory is that a thecodont’s (or some other Archosaur’s) limb position evolved to allow the dinosaur precursors to walk in a more upright position until they eventually could walk on their back legs, becoming the dinosaurs that we know today

from the fossil record. This speculation is not directly based on evidence but is the most plausible conjecture postulated for dinosaur evolution because all other possibilities are even less tenable. No fossil evidence exists for this widely accepted theory, or for any of the other less accepted theories.

Another candidate for the earliest direct dinosaur ancestor is a house-cat-sized animal named *Lagosuchus*, believed by evolutionists to have lived 235 million years ago in Argentina (Horner and Lessem, 1993). Some paleontologists speculate that “*Lagosuchus* or one of its relatives may have been the ancestor of the dinosaurs” because they possessed “many of the features thought to be present in [the] oldest dinosaurs” (Forster, 2000, p. 44). From the fragmentary remains recovered so far, Forster (2000) concludes that *Lagosuchus* is “probably not the ancestor” of dinosaurs but “is at least closely related to the ancestors of the dinosaurs” (p. 45). Others argue that yet some other Archosaur that appeared in the late Permian, many of which strongly resemble crocodiles, were their ancestor (Richardson, 2003, pp. 40–41).

One theory popular for years is that some amphibian crawled out of the water, adapted to land, and eventually evolved into the *Crocodylotarsi* (crocodile ankle) that later evolved into the dinosaurs and the *Ornithosuchia* (bird-crocodile), which became the crocodilians (ex. Forster, 2000, p. 44). Furthermore, the thecodontians are theorized to have given rise to theropods, which gave rise to the saurischians, then the sauropods, camosaurs and coelurosaurs (Croft, 1982). The thecodontians also gave rise to the ornithischians, which gave rise to the ornithopods, and stegosaurs. From these groups evolved pachycephalosaurs, hadrosaurs, ceratopsians, and ankylosaurs (Croft, 1982).

In 1990 three widely accepted hypotheses of carnosauria (meat-eating dinosaurs) origins existed. One hypoth-

esis was that prosauropods were direct descendants from certain thecodontians. Another hypothesis is that carnosaurs were one monophyletic group called theropoda, which evolved from Podokesauridae (Weishampel, 1990). Another theory is that carnosaurs evolved from a primitive coelurosaur-like animal, a group of birdlike dinosaurs. These many theories are all unconstrained by fossil evidence but rather rely on morphological comparisons and conjecture. Consequently, the imaginations of Darwinists are allowed great freedom in developing hypotheses. Some evolutionists reject all of these theories, concluding that dinosaurs evolved from some “unspecified quadrupeds” (Weishampel, 1990 p. 193).

The earliest known ornithischian dinosaur is *Pisanosaurus*, known by only one poorly preserved badly weathered fragmentary skeleton discovered by Galileo Scaglia in Argentina (Forster, 2000, p. 46). Only some jaw parts, a shoulder blade fragment, parts of the hind leg, and a few vertebrae were found. Based on the small, blunt teeth that lie side by side in the jaw, it was first judged to be a very early ornithischian (Forster, 2000). Although the teeth are characteristic of ornithischians, and not either heretosaurs or saurischian dinosaurs, some paleontologists are not convinced that *Pisanosaurus* is even an ornithischian dinosaur. The fact that it was a small, lightly built creature only as large as a medium-sized dog indicates that it may not be a dinosaur at all, but rather an extinct animal of some other type. It is not known if it walked on two or four legs, but evidence suggests that it may have been bipedal (Forster, 2000).

So much controversy over dinosaur origins exists that some argue for diphyletic (having two separate) origins, others for three or four or more separate origins from different stem archosaurs (Fastovsky and Weishampel, 2005). In the 1970s a revolution in dinosaur origins occurred, uniting saurischians and ornithischians,

two very different animals, as well as birds, into one clade, an idea finally widely accepted by the mid 1980s. Also, the group class Thecodontia has now been abandoned by many paleontologists. Although the monophyletic view now dominates, evidence for “multiple roots of Dinosauria might still exist and in fact may be more obvious now that the cover of ‘Thecodontia’ has been blown” (Fastovsky and Weishampel, 2005, p. 91). The reason for these disagreements is because these theories are based largely on speculation, not fossil evidence (Fastovsky and Weishampel, 2005).

The First Dinosaurs

Prosauropods

One of the first putative dinosaurs was the Prosauropoda, a group, of which 17 genera are now known (Forster, 2000, pp. 18–50). The problem with the Prosauropoda origins theory is that they were common at the end of the Late Triassic, both contemporaneously with, as well as *after*, the dinosaurs that they supposedly evolved into (Forster, 2000, p. 50). The herbivorous monsters with long necks, bodies, and tails appeared in large numbers around the world, causing paleontologists to conclude that “they must have evolved and spread very rapidly around the ancient world” (Forster, 2000). Forster (2000) concludes:

Exactly what the ancestors of prosauropods were, what they looked like, and where the prosauropods evolved is still a mystery. Although the name prosauropod, meaning “before-sauropods,” implies they were the ancestors of the enormous sauropods, paleontologists now believe they did not give rise to the sauropods. They were already too specialized to have developed into the sauropods. The prosauropods and sauropods instead shared a common, yet unknown, ancestor, giving them a first cousin relationship. (p. 50)

Herrerasaurus

One of the earliest known well-documented animals described as early pre-dinosaurs are rather small bipedal theropods called *Herrerasaurus* that evolutionists date back to the Late Triassic about 245 million years ago. *Herrerasaurus* were four or five feet tall but may have grown as large as ten feet long and up to 500 pounds. They ran on their hind legs and had huge teeth. Only one complete skeleton has been found, allowing a good picture of the animal (Forster, 2000). The lone complete skeleton is the earliest whole dinosaur skeleton known and was found in Argentina in 1988.

Because *Herrerasaurus* possess many dinosaur features shared by both Saurischia and Ornithischia, *Herrerasaurus* is considered by some their common ancestor, or at least related to their common ancestor. Others conclude that *Herrerasaurus* “wasn’t a direct ancestor” of dinosaurs “but it’s the best we’ve got from that time” (Horner and Lessem, 1993, p. 125). Because it does not have many dinosaurian features, other paleontologists have concluded *Herrerasaurus* were not even dinosaurs (Forster, 2000) but another extinct reptile that happened to have some traits common to both Saurischia and Ornithischia. This confusion “shows how little we know about the early evolution of the dinosaurs” (Forster, 2000, p. 46). Novacek (1996) summarized another theory of dinosaur evolution that argues,

dinosaurs are part of a whole range of forms called archosaurs, where familiar lineages like crocodiles also eventually branched off. But the details of this story—namely which kinds of other archosaurs are clearly the closest kin of the dinosaurs—are not decisively known. It has been suggested that the nearest relatives of dinosaurs may have been some early forms of the winged “flying reptiles,” the pterosaurs. Thus dinosaurs might be rooted in the unknown ancestor

that also gave rise to the pterosaurs. (p. 81)

In other words, a birdlike flying reptile evolved into a dinosaur, and dinosaurs in turn later evolved into birds. This claim illustrates the major problems that exist for determining even a tentative evolutionary phylogeny.

Phylogeny

Because Dinosauria appear in large numbers in many parts of the world and no fossil record exists that documents their evolution, the whole field of dinosaur phylogeny is rife with speculation. One of the most heated proposals was removing dinosaurs from class Reptilia and placing it in a new class called Dinosauria, a major rethinking in paleontology (Weishampel, 1990).

A major problem is that, as so many dinosaurs are known only by fossil fragments, it is difficult to determine what species many belong to, not to mention whether they are a phylogenetic ancestor of some other animal (Forster, 2000). An example is the discovery of three species that some paleontologists concluded were not three *separate* species (*Herrerasaurus*, *Isehisaurus*, and *Frenguellisaurus*) but one species, namely *Herrerasaurus*. Furthermore, many paleontologists consider another putative primitive early dinosaur, the *Staurikosaurus*, to be a herrerasaurid as well. As Fastovsky and Weishampel (2005) conclude, “So far, we haven’t yet identified who within Archosauria might have the closest relationship to Dinosauria” (p. 92).

Another major problem is that constructing phylogenetic trees has proved so difficult that parallel evolution has been proposed to explain the existing conflicting tree hypothesis.

Many similarities in structural features among end forms of different archosaurian lines have not been inherited as such from a common ancestor but have been indepen-

dently acquired by members of the different groups. This, however, does not debar such characters from consideration as indications of relationship. Study of fossil forms increasingly indicates that there has been an enormous amount of parallelism in evolution (Romer, 1966, p. 136).

Much confusion has existed about dinosaur phylogeny for other reasons. An example is a dinosaur called *Iguanodon*, discovered in 1822. The find consisted of a few large teeth that were similar to iguana teeth, only much longer. For this reason the creature was named *Iguanodon*, meaning “iguana-tooth,” and was believed to be a giant iguana. Later, a partial skeleton was discovered and a new reconstruction resulted in a ponderous, heavy creature with a large horn, indicating that the animal was a reptilian, a rhino, or a pachyderm equivalent.

More finds indicated limbs closer to a kangaroo than a pachyderm, producing a kind of chimera. Next, research by T. H. Huxley discovered the creature had a pelvis and hind limbs like a ground-dwelling bird similar to an emu. With more discoveries, it looked more like the picture we have of a *T. rex* today.

The Fossil Record

The fossil record indicates that dinosaurs were “extremely rare in the early part of the Late Triassic,” but by the end of the Triassic entirely “new groups of dinosaurs” had rapidly “spread world wide in an ever-increasing array of species” without leaving a trace of fossil evidence (Forster, 2000, p. 49). The fact is that no one knows why this “ever-increasing array” of new species occurred, nor do we have any fossil evidence to document their evolution — “abrupt appearance” is the only term that can describe what the fossil record reveals. Based on an extensive study of the fossil record, Fastovsky and Weishampel (2005) concluded

that the likelihood of determining the progenitor of any one lineage being fossilized is nil. Dinosaur bones are usually very easy to identify because they have several unique traits, such as an extra hole in their skull, grasping hands, and specialized anklebones,

but it is dinosaurs' hips that are most distinctive. They had five fused sacral vertebrae that helped to create a very strong hip. Together with a specialized socket for the thigh bone, this gave dinosaurs their powerful upright posture. A long tail put their center of balance firmly over the pelvis, allowing them to run on two legs. This also freed their front limbs for catching food. All this was helped by a highly specialized skeleton. Many of their bones contained air sacs, like birds, and in the course of evolution they reduced many bones that were not absolutely necessary for structural strength. For their size, dinosaurs were probably surprisingly light (Haines, 1999, p. 14).

The process used to find a clade's ancestor is to use the hierarchy of characters in the cladogram to determine what features should exist in an ancestor. The next step is to find evidence of

an organism that most closely matches the expected combinations of characters and character states. As we have seen, the likelihood of the very progenitor of lineage being fossilized is nil; however, we can commonly find representatives of closely related lineages that embody most of the features of the hypothetical ancestor (Fastovsky and Weishampel, 2005, p. 92).

The "first dinosaurs are known from a small number of mostly incomplete specimens that so far have been found in only two locations in South America" (Forster, 2000, p. 42). Unfortunately, only partial remains of one animal commonly speculated to be the dinosaur ancestor, *Lagosuchus* and its kin, have been discovered, so its status as the ancestor of the

dinosaurs is highly speculative (Forster, 2000). Many other fossils are incomplete and/or badly damaged, requiring what is assumed to be a closely related animal called an analogy to fill in the missing parts (Shipman, 1986). Analogies are problematic because they require the assumption that two similar fossils can be compared in detail. If two fossils have certain bone similarities, the analogue method assumes that they are also similar in ways that cannot be compared due to lack of physical evidence. The next section looks at some specific examples.

Tyrannosaurus rex

The best-known dinosaur is *T. rex*, an 18-foot-tall, 42-foot-long 14,000-pound monster, the largest carnivore that has ever lived. It was classified as a theropod, a meat-eating, hollow-boned animal that can range in size from the Placodus and the ichthyosaur *Cymbospondylus*. All dinosaurs are postulated to have evolved from an animal the size of a chicken. So far 32 *T. rex* specimens have been located, half of which are close to complete (Weishampel et al., 2007). Horner and Lessem (1993, p. 124) wrote, "*T. rex* was the last and most spectacular product of dinosaur evolution. It was an experiment that can't be repeated."

Darwinists estimate that dinosaurs first evolved 225 million years ago, and *T. rex* 190 million years ago. How they know this from only 32 specimens is unknown. So far, not a single direct *T. rex* ancestor has been located. Potential ancestors, including *Coelophysis*, *Herrerasaurus*, *Eoraptor*, and *Allosaurus*, all have been eliminated by most experts as possible *T. rex* ancestors.

Two fossil specimens considered by some paleontologists to be the most primitive *T. rex* fossils are a dinosaur called Guanlong Wucaii (Xu et al., 2006). This dinosaur identified as a *T. rex* ancestral link from the teeth and pelvic structures is a nine-foot-long adult that had a head crest that was about 2.5

inches tall and as thin as a tortilla. The crest is believed to be an ornamental feature used to attract mates.

The leading experts, Horner and Lessem, admit the animal that the *T. rex* and the tyrannosaurids evolved from is not known: "maybe they came from the allosaur line of big predators, maybe they came from a common ancestor, along with the Troodontids, a man-sized group of dinosaurs with many birdlike features" (Horner and Lessem, 1993, p. 127). Horner and Lessem (1993, p. 127) admit that, although "you can imagine a hypothetical ancestral tyrannosaurid," no evidence of this hypothetical ancestor has ever been found. They conclude a logical *T. rex* dinosaur ancestor is a meat-eating creature, but "which one we can't say yet" (Horner and Lessem, 1993, p. 127).

Another very early dinosaur, *Ornithodesmus*, was first identified as a pterosaur (Parker, 2003). Further studies concluded it was not a pterosaur but rather a small dinosaur. Other fossils first identified as ornithodesmus have been regrouped back with the pterosaurs! Many other examples of dinosaur reclassification could be cited. Eight named and one unnamed species of Troodontidae exist, and four phylogenetic hypotheses have been proposed to explain their origins (Weishampel et al, 2007).

Clearly, the "evidence is limited and there continue to be many disagreements" in the field of dinosaur phylogeny, and often these disagreements are to the degree that it calls into question the basis of dinosaur macroevolution (Parker, 2003, p. 159). The enormous differences between pterosaurs and ornithodesmus illustrate the difficulty of even determining the type a set of dinosaur bone fragments belongs to, even if a complete skeleton, which is only five percent or less of the animal, exists. Identifying evolution transitional forms is even more difficult.

Another problem is that dinosaurs were not primitive as the word is nor-

mally defined. An example is the intelligent design of the eye of *T. rex*. It has been assumed that they had very poor, fussy vision, but recent research has shown that they were able to achieve very detailed images similar to that of many modern animals (DeYoung, 2000). Many other examples exist to show that dinosaurs were very well designed for their environment.

Horned Dinosaurs

Horned dinosaurs (ceratopids) were very successful animals that lived throughout the northern hemisphere (Norman and Wellnhofer, 2000). The ceratopians (horned-face) had shelf-like ridges or expanded areas around their skull edges and a sharp, narrow parrot-like beak (Parker, 2003). They ranged from the size of a pig to twice the size of large rhinoceroses, which they resemble. The best-known horned dinosaur, and one of the largest, was the *Triceratops*. *Triceratops*, meaning “three-horned face,” is an ornithischian dinosaur that has a pelvis shape similar to that of birds, and a crownlike hat, plus three large horns, two on its head and one on its snout, providing the source of its name.

Since their horns preserve well and literally hundreds of remains of these dinosaurs have been uncovered, horned dinosaurs as a group are excellent examples useful to determine the limits of evolution. Although hundreds of *Triceratops* skeletons, many very complete, have been found since the first one was uncovered in 1855, no evidence of their evolution has ever been uncovered. This is especially problematic for Darwinists because it is the largest horned dinosaur known, and it is easily identified by its very unique skeletal traits, especially its distinctive skull and horns. In one location alone, thirty-two *Triceratops* skulls were recovered.

One theory is that they evolved from “bipedal ancestors not unlike *Psittacosaurus* or *Microceratops*,” but

the only evidence for this theory is their morphological similarity. Since no fossil evidence exists to support any evolution theory, this speculation remains assumption (Norman and Wellnhofer, 2000, p. 136). Parker concluded that horned dinosaurs “were, in general, a group that underwent relatively little evolution, as is evident from the many thousands of specimens that have been found in hundreds of sites” (2003, p. 373).

The fossil record shows that “the horned dinosaurs were relatively ‘conservative,’ a term used to describe a group that does not change very much from its original basic shape and form, despite a long time for evolution to occur” (Parker, 2003, p. 373). In other words, as is true of all dinosaurs, they appeared suddenly in the fossil record as fully developed, horned dinosaurs and did not change until they became extinct. They have been dated all the way to the very end of the dinosaur age. Norman and Wellnhofer (2000, p. 134) wrote that the evolutionary “relations of the so-called short-frilled ceratopids are not clear. Each is so distinct that kinship is not at all obvious.”

Conclusions

Over 30 million dinosaur bones and parts, some in excellent states of preservation, have been identified, and although much speculation exists, not a single documented plausible direct ancestor has yet been located. All known dinosaurs appear fully formed in the fossil record. As Forster (2000, p. 42) admits, “much mystery remains about the origin of the dinosaurs.” Several possible candidates for their ancestors have been suggested, but difficulties exist with all of them, and most are likely only extinct reptiles and not evolutionary links. Furthermore, confusion has reigned for more than a century over dinosaurian phylogeny in spite of the discovery of much fossil evidence.

For this reason, other methods have been utilized to determine their phylogeny. Since 1980 cladistic methods have revolutionized our views of their phylogeny. Computer algorithms also have been used to produce similarity comparisons, often using contemporaneously existing species that are limited in helping us to determine their evolutionary history.

Benton (1984, p. 142) concludes that so “many riddles remain unsolved” that “a single fossil find can sometimes provide us with exciting new evidence and provide all new theory.” How dinosaurs “came to be” and what they are, are “questions pondered since the creation of the name by Sir Richard Owen just over 150 years ago” and are still being asked (Fastovsky and Weishampel, 2005, p. 87). We can conclude with the following observation, which is still true today:

Although many pages have been written discussing the mystery of the extinction of the dinosaurs, almost as much uncertainty surrounds their origin—or origins. ... the poor paleontologist searching for answers is therefore, in the origin of the dinosaurs, confronted with complexity where he hoped for simplicity, while in the replacement of the pseudosuchians by their varied offspring he meets a sudden (if delayed) simple event where he expected complexity (Cox, 1976, p. 3140).

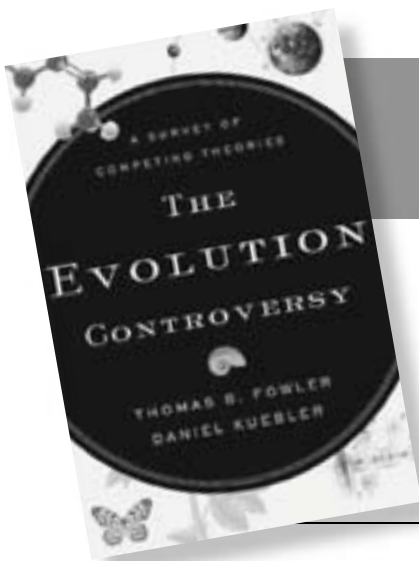
The more paleontological discoveries that are made, the more we realize our knowledge is complete and still no ancestral form is found. As a result, paleontologists are forced to conjecture about their ancestors based on little evidence. In conclusion, no credible evidence exists for dinosaur evolution from a primitive precursor animal, supporting the creation model. Dinosaurs appear suddenly and evidently also went extinct rather suddenly.

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Book Review

The Evolution Controversy: A Survey of Competing Schools

by Thomas S. Fowler
and Daniel Kuebler

Baker Academic, Grand Rapids,
2007, 382 pages, \$28.00.

Authors Fowler and Kuebler compare and contrast the various schools of thought regarding origins and the development of life on Earth. The book discusses biological issues; the origin of the universe, psychology, sociology, linguistics, and religion are left largely

unaddressed. Similar books have had proponents write a chapter supporting their viewpoint and then have others critique the chapter. Fowler and Kuebler choose to evaluate each position themselves, giving the evidence pro and con for each.

The book begins with a brief history of the controversy, a review of the evidence, and the principle points of dispute. The next section discusses the major origin positions including the neo-Darwinian, creationist, intelligent design, and meta-Darwinian schools.

The neo-Darwinian camp claims that natural selection and mutations are sufficient to explain the development of life on Earth. The creationist school is represented by the young-earth position. God was active in establishing the original life-forms; change in morphology and genetics is limited within a comparatively brief time frame. Other creation positions such as theistic evolution and progressive creation are only briefly referenced. Intelligent design has much commonality with creation, emphasizing irreducible complexity, aside from the age issue. Lastly, the meta-Darwinian school includes macroevolution, punctuated equilibrium, exaptation, neutral theory, complexity theory, and endosymbiosis.

The final section deals with public policy issues and a summary of the four origins positions. One valuable feature of this book is its many summary tables. The volume also includes a helpful glossary of terms, a bibliography, and an index.

How does one present the various views on a contentious issue without taking sides? The authors claim “that this book is more objective than any other that we know of on the subject” (p. 15). They hold no theory as a priori truth and evaluate each on a strictly scientific basis. The authors state that no position must emerge as the winner. A host of prepublication reviewers have striven mightily to ferret out any hint of bias (pp. 16–17).

But bias does indeed creep in, beginning with the title, *The Evolution Controversy*. In the public’s mind, evolution assumes that “common descent ... by natural forces alone are responsible for the emergence of all organisms” (p. 366). The first sentence of chapter 1 begins, “Charles Darwin’s theory of organic evolution...” (p. 21). Since neo-Darwinism is the reigning consensus of the intellectual-academic establishment, other competing schools are constantly playing catch-up or reacting to this naturalist paradigm. Perhaps a more neutral title like *The Origins Controversy* would prepare the reader for an equal start at the opening gate. Each school should begin with a clean slate in presenting evidence. For example, the authors assume the validity of vast geological time without proving it, appealing to the authority of “the commonly accepted chronology” (pp. 84, 86).

The creationist chapter describes the major U.S. creation science organizations: The Institute for Creation Research, Creation Research Society, Answers in Genesis, Geoscience Research Institute, and Center for Scientific Creation (Walt Brown). Six major hurdles (pp. 195–196) are erected for creation science to be a viable alternative to evolutionism. They are the distant starlight problem, terrestrial evidence for a very ancient earth, radioisotope dating, the fossil record, uniformity of the genetic code (pseudogenes, syntenic blocks), and

similarities of physiology and function of organisms suggesting common ancestry of all life. Creationist answers to these problems are given and evaluated. For creation friendly readers of this section, a sense of frustration results because of the superficial examination of the evidence and arguments. While the authors strive for balance, it seems as if they pick and choose from the creationist literature, giving an uneven evaluation. One example is the treatment of the second law of thermodynamics (entropy) argument. The authors give the evolutionist “open system” response (pp. 225–226) without evaluating the creationist counterarguments. Introducing raw energy alone to an open system will not create complexity; a coded plan or template needs to exist for growth to take place. Another example of superficial handling concerns the RATE group findings. The first RATE book is referenced (p. 219), and the 2005 RATE conclusions are mentioned (p. 220), but the final research results are not evaluated.

Fowler and Kuebler do a reasonable job in presenting origins views in a fairly objective fashion. The primary merit of *The Evolution Debate* is its summary of arguments and counterarguments. However, many partisans of each school will be less than satisfied with their presentation and evaluation.

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Stellar Radiation Entropy as Evidence of Supernatural Order and Creation

James R. Powell*

Abstract

The second law of thermodynamics, or increasing entropy, is one of the most fundamental and empirical laws of physics, and it holds great implications for understanding order and design in the universe and the origin of this order. Large increases in entropy from stellar radiation contribute to diffusion of energy and point to a high state of initial energy order that cannot be accounted for naturally or solely by the first law of thermodynamics. This is one of the greatest arguments for supernatural order that can only be the result of a Creator.

Introduction

The second law of thermodynamics is an immutable law of physics never violated by observation or experiment, and ever-increasing entropy in any closed or bounded system points directly to an earlier state of higher energy order. Sir Arthur Eddington was an English astrophysicist and contemporary of Einstein who theoretically investigated stellar interiors and temperature and first proposed that star radiation is a subatomic process, now known to be the nuclear fusion of hydrogen. Eddington (1929) wrote:

The law that entropy always increases—the second law of thermodynamics—holds, I think, the supreme position among the laws of nature. If someone points out to you that your pet theory of the universe is in disagreement with Maxwell's equations—then so much the worse for Maxwell's equations. If it is found to be contradicted by observation, well, these experimentalists do bungle things sometimes. But if your theory is found to be against the second law of thermodynamics I can give you no hope; there is nothing for it but to collapse in deepest humiliation (p. 74).

More recently, Professor Thomas Banks of the Department of Physics, UC Santa Cruz, has stated, “The Second Law of Thermodynamics is one of the most robust and profound physical principles ... Ever since the discovery of the Second Law, physicists have been faced with the question of why the universe began in a low entropy state” (Banks, 2007, p.1).

On the grandest cosmological scale, radiant energy from billions of stars illuminates the universe, producing a large and possibly the predominant entropy source along with quasi-stellar active galactic nuclei (AGN), gamma ray bursts (GRBs), and supernovae. For a numerical example, an estimate of stellar entropy demonstrates that a large source of energy and earlier state of order is required for this emission of radiant energy to even be possible. *Energy order* is a proposed conceptual term, which we will discuss in more detail later in this paper; it better quantifies energy as order as contrasted with the disorder of entropy.

Entropy is one of the greatest witnesses to God's sovereign power and control over the universe attested to by Scripture in Romans 8:20–21: “For the creation was subjected to futility, not of its own will, but because of Him who subjected it, in hope that the creation itself also will be set free from its slavery to corruption.”[†]

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Stellar Radiant Energy Entropy

The most fundamental form of the second law of thermodynamics as established by Boltzmann, (Fermi, 1937) is:

$$S = k \ln w, \quad (1)$$

where S is the entropy in units of J/K, k is Boltzmann's constant, and w may be thought of as the thermodynamic probability of an isolated system being in a particular state, a dimensionless number that connects the microscopic, or statistical level, to the macroscopic, or classical measurements (Fermi, 1937, p. 57). This is true since w is the number of microstates corresponding to an observed macrostate as the measure or degree of disorder of a system. A change in entropy can be written by expanding equation (1) in differential form to compare microstates as

$$\Delta S = k \ln (w_f/w_i), \quad (2)$$

with w expanded into a ratio of microstates, the final microstate over the initial microstate. This equation follows from any ΔS as the macroscopic sum ($S = S_1 + S_2 + \dots + S_n$) of a number of microscopic incremental dS changes (such as from radiant energy photons) equal to $S_f - S_i = (k \ln w_f) - (k \ln w_i) = k \ln (w_f/w_i)$. The initial or ground state of entropy, $w_i = 1$, corresponds to perfect order posited at creation (Van Ness, 1969, pp. 93–94). The differential increase in entropy also can be written as (Fermi, 1937, p. 52):

$$dS = dQ/T, \quad (3)$$

where dQ is the heat energy added to a closed system in thermodynamic equilibrium at temperature T and dS is the incremental transformation of energy into entropy. An estimate of the increase in the entropy of the universe due to stellar radiation as an entropy rate (from the appendix) is

$$\begin{aligned} dS/dt &= dQ_T/(dt T_{\text{cmb}}) = n\sigma T_{\text{avg}}^4 A_s/T_{\text{cmb}} \\ &= 1.16 \times 10^{49} \text{ [J/sK]}. \end{aligned} \quad (4)$$

For an order-of-magnitude estimate of the stellar radiation contribution to the overall entropy change of the universe each second, we can equate the entropy change equation (2) per second and this expression for the rate of change of entropy from stellar radiation (4) to yield

$$k \ln (w_f/w_i) = n\sigma T_{\text{avg}}^4 A_s/T_{\text{cmb}}. \quad (5)$$

Therefore,

$$w_f/w_i = e^{[(n\sigma T_{\text{avg}}^4 A_s)/kT_{\text{cmb}}]}, \quad (6)$$

where equation (6) is the ratio of microstates due to radiated energy from stars diffused each second into the quiescent radiation background or 'blackness' of space at $T_{\text{cmb}} = 2.725$ K. For the estimated number of stars at a median radiation temperature of 6000 K radiating from the total stellar surface area into the universe at T_{cmb} , equation (6) yields the ratio

$$w_f/w_i = e^{8.43 \times 10^{71}} \text{ or } \ln(w_f/w_i) = 8.43 \times 10^{71}. \quad (7)$$

This dimensionless number is the increase in microstates and disorder due to the energy radiated by all stars each second in the observable universe. The incremental entropy rate is the same numerical result as equation (4),

$$\Delta S = k[\ln(w_f/w_i)] = k(8.43 \times 10^{71}) = 1.16 \times 10^{49} \text{ [J/sK]}. \quad (8)$$

The total radiated energy each second from equations (3) and (4), $dQ = (dS/dt)(T)$, or $(dS/dt)(T_{\text{cmb}}) = (1.16 \times 10^{49} \text{ J/sK})(2.725 \text{ K}) = 3.16 \times 10^{49} \text{ J/s}$. This means that, for this example, the estimated entropy increase from stellar radiation across the universe during the 500 seconds it takes for sunlight to reach earth is $5.8 \times 10^{51} \text{ J/K}$. From the first law of thermodynamics, $dU/dt = dQ/dt - dW/dt$, where dW/dt is the amount of work done per second, equal to zero in this case (Van Ness, 1969, p. 28). Given that $dQ/dt = (dS/dt)(T)$, the rate of change of internal energy, $dU/dt = (dS/dt)(T)$. Where did this large amount of energy radiated each second, $dU/dt = 3.16 \times 10^{49} \text{ J/s}$, originate? Could anything we know about in the natural universe be the source of this energy, or the high state of order transformed into entropy each second in equation (8)? Could this reasonably be accounted for as originating in another natural process, considering that all observed natural processes tend to increasing entropy and decreasing energy order? Or, if disorder results only from ordered energy, then what is the source of this order? Since energy cannot be created or destroyed naturally, and every natural or spontaneous process tends to disorder, then the origin of order cannot be natural but must be supernatural.

Discussion

The classical thermodynamics association of "disorder" with entropy is now being questioned because an increase in entropy, as an increase in disorder in any closed system as a completely natural process, is in direct conflict with evolution. Evolution is also defined as a natural or spontaneous process that supposedly "reverses" entropy with an unknown source of added energy. The escape from these philosophical entanglements is to require that entropy be restricted to

quantitative measurements in units of J/K. Equation (8) is a real entropy in J/K per second that requires initial energy order to enable the diffusion of energy. “Entropy is a measure of the unavailability of a system’s energy to do work; *also a measure of disorder; the higher the entropy the greater the disorder*” (Daintith, 2005, emphasis added). In a recent paper, C. G. Chakrabarti and I. Chakrabarti state that w in equation (1) is “the degree of disorder or simply disorder of the system,” and they rewrite equation (1) directly as “Entropy = $k \ln(\text{Disorder})$ ” (Chakrabarti and Chakrabarti, 2007, p. 560). Freeman Dyson, the Nobel laureate, has said, “The laws of thermodynamics decree that each quantity of energy has a characteristic quality called entropy associated with it. The entropy measures the degree of disorder associated with energy ... The highest form (of energy) being the one with the least disorder or entropy.” (Dyson, 1971, p. 52).

Therefore, as understood scientifically, entropy *is* disorder, or energy disorder. To quantify disorder with the necessary formalism, we can define “energy order” as the ratio of total energy to entropy, or the “orderliness” of energy in terms of the amount of disorder, fractionally. In the case of blackbody radiation, this radiant energy order as a ratio, $\mathcal{E}_0$, is

$$\mathcal{E}_0 = dU/dS = aT^4V/(4/3)aT^3V = \frac{3}{4}T \text{ [K]} \quad (9)$$

where the change in internal energy, $dU = aT^4V$ is the total radiant energy in a volume V , and $dS = (4/3)aT^3V$ is the magnitude of blackbody radiation entropy in the same volume, V (Planck, 1959). $\mathcal{E}_0$ is thus the energy order dependent solely on T , or temperature as the *quantification of thermal radiant energy order*. This logically follows from thermodynamics in general since thermal energy heat flow is always dependent on ΔT . The energy order of the CMB, for example, is $\frac{3}{4}(2.73\text{K}) = 2.05\text{K}$, or low energy order given the low usable energy-diffuse nature of the background radiation. The sun as a blackbody radiator at 5900 K has an energy order of 4425 K, much more usable energy, or much higher energy order than the CMB. $\mathcal{E}_0$ may thus be a useful metric and quantification of energy order over disorder, an indicator of available thermal radiant energy in terms of entropy. Eddington (1929, p. 71) states, “As regards heat-energy the temperature is the measure of its degree of organisation; the lower the temperature, the greater the disorganization.” The quantification of energy order in terms of temperature is thus an inverse measure of entropy.

Entropy necessitates supernatural order and a Creator. Dr. Helge Kragh labels this the “entropic creation argument,” highlighting a 1991 paper by Peter T. Landsberg, “From Entropy to God?” (Kragh, 2007, p. 369). Landsberg (1991) writes,

The entropological ‘proof’ for the existence of God runs roughly as follows. The entropy law ensures that an isolated system reaches internal thermal equilibrium possibly after a

finite time and certainly after an infinite time, after which only fluctuations about this equilibrium state can take place. As the universe is far from equilibrium it must have a finite age and hence a beginning. This beginning must be a state of minimum entropy at which the cosmos was born. This was brought about by God who also created values of parameters such as initial energy, matter, entropy and so on (p. 383).

Kragh (2008) adds that,

Assuming that the law of entropy increase is valid for the universe as a whole, it is but a small step to conclude that the universe cannot have existed eternally. If so, it has presumably come into existence some finite time in the past, an event that many people would not hesitate to identify with a creative act. The claim that thermodynamics leads to a finite-aged, created universe has been called the entropological or *entropic argument* for creation (p. 47).

Similarly, Bishop E. W. Barnes (1933) has written,

It is a singular fact that ... speculations based on the second law of thermodynamics seem to re-establish the cosmological argument (for the existence of God) with the utmost directness and simplicity. The organisation of the energy of the cosmos is always diminishing...as a result of it there will finally be in the cosmos no organised energy capable of doing work. In the beginning there must have been a maximum organisation of energy ... Against this thermodynamical argument we can bring no valid objection (pp. 595–596).

This was summarized best, however, by Dr. Henry Morris Jr., founder and past president of the Institute for Creation Research, in his paper, “Entropy and Open Systems”:

The entropy principle points directly to creation. That is, if all things are now running down to disorder, they must originally have been in a state of high order. Since there is no naturalistic process which could produce such an initial condition, its cause must have been supernatural (Morris, 1976, p. 6).

Dr. Gordon Van Wylen, former chairman of the Department of Mechanical Engineering at the University of Michigan, has commented that the question that arises is how the universe got into the state of reduced entropy in the first place, since all natural processes known to us tend to increase entropy. Van Wylen and Sonntag conclude this subject by stating, “How did [the universe] get in the low state of entropy? ... the authors see the second law of thermodynamics as man’s description of the prior and continuing work of a creator” (Van Wylen and Sonntag, 1973, p. 248). It is fitting to conclude this section with a comment by Eddington (1933):

It is the opposite extrapolation towards the past which gives real cause to suspect a weakness in the present conception of science. The beginning seems to present insuperable difficulties unless we agree to look on it as frankly supernatural. We may have to let it go at that (pp. 124–125).

Conclusion

Entropy increase ranks among the most absolute and observable physical principles in the universe. Everything is becoming increasingly disordered in terms of available energy because entropy, the disordering of energy, is irreversibly increasing as demonstrated by the large entropy change from star radiation. If this diffusion of energy is quantifiable and real, then it must result from preexistent energy order that is just as quantifiable and real, and this ordered state also cannot be accounted for as originating from another natural, entropy-increasing process. This quantification of order implies design as believed by Eddington (1929):

“We admit that the world contains both chance and design, or at any rate chance and the antithesis of chance. This antithesis is emphasized by our method of the measurement of entropy” (p. 77).

The initial or originating order must be the result of a supernatural process, from the Creator Himself. Again, from Eddington (1929):

Travelling backwards into the past we find a world with more and more organisation. If there is no barrier to stop us earlier we must reach a moment when the energy of the world was wholly organized with none of the random element in it. It is impossible to go back any further under the present system of natural law (p. 84).

In the apostle Paul’s letter to the Romans, he writes, “For since the creation of the world His [God’s] invisible attributes, His eternal power and divine nature, have been clearly seen, being understood through what has been made” (1:20). The word for “world” used here is the Greek word *kosmos*, which means “order,” the subject of this paper. Looking at “His eternal power” in this verse in more detail, the Greek word for power is *dynamis*, which means “[miraculous] power, might, or strength, or the ability to accomplish a task or do work (Thomas, 1981, p. 1644). This could be interpreted identically with the scientific definition of power, the capacity to exert energy or do work per unit time in units of watts or Joules/second. The applied energy, then, in Romans 1:20 would be power (in watts, or J/s) x time (s) with $t \rightarrow \infty$, which means infinite energy. This source of infinite energy can only be the infinite God who created the universe with the high state of initial order attested to by the increasing entropy we observe. One of the greatest evidences of the supernatural God of the universe is the increase in entropy and disordering of energy in all natural processes, which can only be the result of the initial order established by God Himself and understood through what has been made. The logical conclusion of Dr. Emmett Williams is:

It seems more reasonable to believe that the existing order and complexity in the physical universe was created into it by God ... Scientific laws overrule the process of evolution ...

Evolution is neither a conservative nor a degenerative process. Therefore it is concluded that evolution could not have occurred, since the first and second laws of thermodynamics would prevent any process that consistently produces greater order and complexity in the physical universe (Williams, 1981, pp. 21–22).

Again, from Eddington (1929),

As a scientist I simply do not believe that the present order of things started off with a bang; unscientifically I feel equally unwilling to accept the implied discontinuity in the divine nature [that God wound up the material universe and left it to chance ever since]. But I can make no suggestion to evade the deadlock (Eddington, 1929, pp. 84–85, brackets added).

We cannot see the infinite, eternal God directly, but we can understand more about Him through what has been made and how the creation is increasingly disordered in terms of available energy according to His Word. In Romans 8:20–22, we read:

For the creation was *subjected to futility*, not of its own will, but because of Him who subjected it, in hope that the creation itself also will be set free from its *slavery to corruption* into the freedom of the glory of the children of God. For we know that the whole creation groans and suffers the pains of childbirth together until now (emphases added).

This observed trend to disorder necessarily leads us to order, and the order of the universe is the most overwhelming proof of the existence of the God of the Bible. German Nobel laureate, physicist Max Planck, explains this order in a May 1937 address.

At all events we should say in summing up that, according to everything taught by the exact sciences about the immense realm of nature ... a certain order prevails—one independent of the human mind. Yet, in so far as we are able to ascertain through our senses this order can be formulated in terms of purposeful activity. There is evidence of an intelligent order of the universe (Planck, 1968, p. 144).

Entropy is the observable transformation of ordered energy into a less ordered state. This posits a supernatural source of order that was understood by Einstein. In his biography of Einstein, Isaacson (2007) writes:

But mainly, his beliefs seemed to arise from the sense of awe and transcendent *order* that he discovered through his scientific work. Whether embracing the beauty of his gravitational field equations or rejecting the uncertainty in quantum mechanics, he displayed a profound faith in the *orderliness* of the universe” (p. 385, emphases added).

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Appendix: An Estimate of Stellar Radiation Entropy

For ideal blackbody radiant energy-heat transfer into free space at a low $T(K)$ with transmissivity $e \approx 1$,

$$Q = U = aT^4V \quad [J] \quad (i)$$

(Planck, 1959, p. 63). This is the energy of blackbody radiation at $T(K)$ in a volume V which is the total radiant energy in Joules with the radiation density constant $a = 8\pi^5k^4/15c^3h^3 = 7.57 \times 10^{-16} \text{ J/m}^3\text{K}^4$, and Boltzmann's constant $k = 1.38 \times 10^{-23} \text{ J/K}$ (Weisstein, 2007); and T is the radiation temperature of the blackbody source.

We can better quantify radiant energy transfer in terms of radiant exitance or radiant emittance from an emitting surface, M , in $\text{Js}^{-1}\text{m}^{-2}$ or wm^{-2} , as from the surface of an emitting star. Energy dQ/dt radiated each second would then be,

$$dQ/dt = \Phi = MA_s = \sigma T^4A_s \quad [\text{Js}^{-1}] \quad (ii)$$

(Simon, 1974, p. 36), where σ is the Stefan-Boltzmann constant $= 5.67 \times 10^{-8} \text{ wm}^{-2}\text{K}^{-4}$; M is the radiant exitance, from the Stefan-Boltzmann equation; A_s is the spherical surface area of the emitting star, and using our sun as the median main sequence star, $A_s = 4\pi R_s^2$ and radius of the sun $\sim 7 \times 10^8 \text{ m}$; T is the radiant energy temperature; and Φ is the radiant flux in Js^{-1} or watts.

For an order-of-magnitude calculation, we can estimate dQ/dt for the number, n , of stars in the observable universe or "Hubble volume" using (1) A median radiation temperature, T_{avg} of 6000K for stars derived from the Hertzsprung-Russell (H-R) diagram line of main sequence stars (90% of all stars) with similar radiation temperature to our sun's photosphere at 5900K (Simon, 1974), a typical main sequence star (Goddard Space Flight Center, 2008a); and knowing that (2) star radiant energy closely conforms to the ideal blackbody radiation spectrum (Simon, 1974). A_s is the spherical surface area of the average main sequence star like our sun $= 4\pi (7 \times 10^8\text{m})^2 =$

$6.16 \times 10^{18} \text{ m}^2$. Equation (ii) now becomes a total star radiant energy rate,

$$dQ_T/dt = M_T A_s = \Phi_T = n \sigma T_{\text{avg}}^4 A_s \text{ [J/s]}, \quad (\text{iii})$$

where n is approximately 7×10^{22} stars (Britt, 2003). This is a conservative number since some scientists think it may be higher. "Today the total number of stars in the observable universe is estimated to be 10^{25} ... Nobody knows the actual number" (Gitt, 1996, p.19). Combining equations (3) and (iii) we can estimate the entropy change dS due to stellar radiation each second as

$$\begin{aligned} dS/dt &= dQ_T/(dt T_{\text{cmb}}) = n \sigma T_{\text{avg}}^4 A_s / T_{\text{cmb}} \\ &= 1.16 \times 10^{49} \text{ [J/sK]}, \end{aligned} \quad (\text{iv})$$

where T_{cmb} is the equilibrium temperature of the cosmic microwave background radiation (CMB), also a blackbody spectrum at 2.725K (Goddard Space Flight Center, 2008b). Entropy rate, dS/dt , here, is an estimate of total stellar radiant energy diffusion into the universe each second.



Book Review

God of Wonders

DVD
produced by Jim Tetlow

Eternal Productions, 2008,
85 minutes, \$20.00.

This DVD is hosted by Dr. John Whitcomb and features stunning photography and computer animation. It highlights the glories of nature including deep space, hummingbirds, and atomic details. The program demonstrates that the glory of God is evident throughout the created world. There are four subsections to the film featuring God's power, wisdom, justice, and love. The producers show how these attributes of God can be clearly seen in nature and the human conscience. The last part of the production deals with the sinful state

of man and the remedy for that state, Jesus Christ.

The substance of the video includes interviews with several creation scientists including Don DeYoung, Jason Lisle, and Larry Vardiman. Each interview focuses on some aspect of creation or life forms which highlights attributes of the Creator. There is special coverage of thunderstorms, the energy within the atom, and the design of the butterfly and hummingbird. The quality of the nature footage is spectacular, although some of the interviews are less professional.

The last two sections of the DVD include confrontational interviews with people about their conscience and what this tells us about God. The gospel message is clearly presented in the last section of the video entitled "God of Love." This video is a valuable asset to the creationist library, and promises to appeal to young and older audiences alike.

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Notes from the Panorama of Science

Lessons from Twentieth-Century Geology

Introduction

Today's creationists—facing an aggressive, powerful monopoly of atheism—can easily forget that nothing is new under the sun. Our forefathers faced the same in the 1960s; it was less overtly atheist (they just called it “science” then) but no less assertive or driven by a religious commitment to naturalism. One of the leaders in the field of geology during the early days of creation science was Marion King Hubbert (1903–1989). A short analysis of his writing from the mid 1960s opens a window onto the world faced by Drs. Morris and Gish and their colleagues.

Hubbert (Figure 1) was born in 1903 in San Saba, Texas, and was educated through the PhD level, earning that degree at the University of Chicago in 1937. He worked as a geophysicist for

the Shell Research Lab from 1943 to 1964 and then became a fixture at the United States Geological Survey until his retirement in 1976. He also taught in the California University system at Stanford and Berkeley. During his day, he was one of the best-known geologists in the world, famous for his bell-curve predictions about the future of the world's oil supply (Figure 2). He was a president of the Geological Society of America and an honored member of the National Academy of Sciences.

But Hubbert was also an aggressive proponent of naturalism, though in the mid-twentieth century, the term “world-view” did not possess today's familiarity. Nor was there a significant perception in the church or in the public that philosophical and religious commitments characterized atheists. Positivism

still had a tight grip on the culture, opposition to God was simply “science,” and Hubbert was no exception. His 1967 article, “Critique of the Principle of Uniformity,” provides an interesting window on the hurdles faced by the early creationists. Even more interesting are the erroneous views about history and philosophy that were part and parcel of that day's thought. Enlightenment propaganda still had a tight grip on Western culture. For example, his view of the history of his science was nothing more than an atheistic rant:

During the last five hundred years, the tortuous evolution of geological science has been characterized by a progressive emancipation from the constraints and impediments imposed by assumptions of Special Creations and interferences from



Figure 1. Marion King Hubbert. From peake.blogspot.com/2006_03_01_archive.html (as of August 14, 2009).

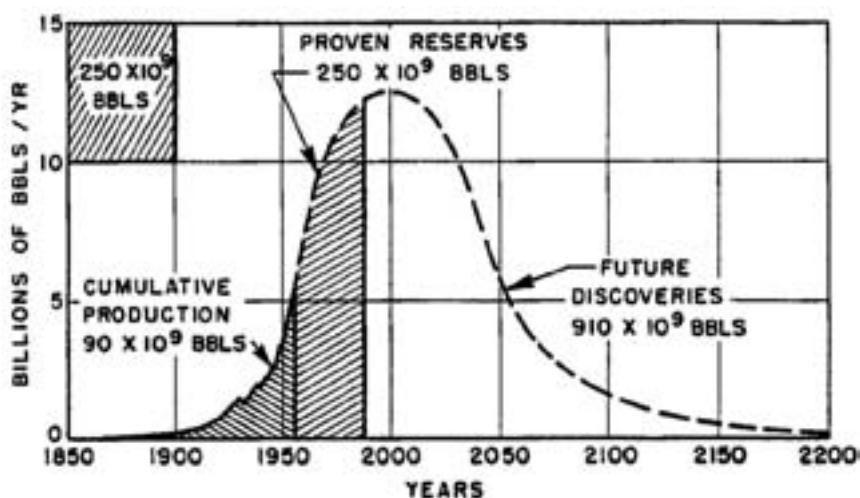


Figure 2. The Hubbert Curve predicted the world's future oil supply and has proved remarkably accurate in the decades since Hubbert's first prediction in 1956. From www.geo.cornell.edu/.../peak_oil.html (as of August 14, 2009).

Divine Providence in geological (and human) affairs. A major part of this emancipation has been accomplished by the employment of the Principle of Uniformity, but this rests upon insecure grounds due in large part to its having been formulated in ignorance of the later-developed laws of thermodynamics (Hubbert, 1967, p. 31).

American pragmatism is on full display too. Despite the fact that he places little confidence in the principle of uniformity, he rejoices that it was so useful in overthrowing a biblical view of science and history. His vitriol continues all the way to his conclusion. After retelling the story of the French astronomer Laplace dismissing the necessity of the “God Hypothesis” when talking to Napoleon, Hubbert (1967, pp. 31–32) echoes the same dream for geology: “It may be that the time has now arrived when geologists too may explicitly declare their lack of necessity for that particular hypothesis.”

Ironically, God had other plans. The Creation Research Society had just been founded, and the Institute for Creation Research was just over the horizon. Today many more people recognize that atheism is a religion and that science owes its origins to Christianity. A closer look at Hubbert’s paper reveals a number of other related errors, both in his understanding of the history of geology and the philosophical positions associated with it. Examining examples of both can help us see just how much things have changed since the early days of creation science.

Errors of History

Only recently have the myths surrounding the origins of geology been identified as such and set aside by serious historical study. It is interesting to examine the extent to which these errors were entrenched in the highest echelons of geological thinking, even in the 1960s when pioneers like Reijer Hooykaas (1963)

were demonstrating otherwise. Hubbert demonstrates that even the intellectual elite were not immune from bad history and even worse philosophy. All of these errors have one thing in common—they were myths used in the service of an anti-Christian naturalism.

Among them is one still bravely pushed by atheists, despite its repeated scholarly repudiation. As the story goes, the true significance of the Copernican revolution was the blow to Christianity caused by the displacement of man from the center of the universe and therefore from the center of God’s affections and attentions.

Inevitably, the demise of the geocentric system carried with it strong repercussions for the philosophical systems and theological dogmas which formed its principle supports. The theological dogma that the earth, being the abode of God’s favorite Creation, Man, could not occupy a lesser place than the seat of honor at the center of the universe, was severely shaken by the establishment of the earth, not as the stationary center of the universe, but as only one of the six known planets encircling the sun (Hubbert, 1967, p. 3).

We know better now (and some historians knew better then). For example, Hooykaas (1999) summarized his research (dating back to the mid twentieth century) in his final book. Regarding the Copernican myth, he noted,

a supposed connection between man’s rank in the hierarch of created beings and the ‘importance’ of the place of this terrestrial abode has occupied many writers on the Copernican controversy (Hooykaas, 1999, p. 153).

He then debunks the idea:

The proponents of this explanation deem it unnecessary to adduce solid proofs for their contention. Yet it is one of those ‘clever’ constructions by moderns who think they know better than our ancestors themselves what

were their real motives (Hooykaas, 1999, p. 153).

After explaining that religious opposition to Copernicus had only been advanced on exegetical grounds, not doctrinal, he stated that it “did not change anything in religious belief” (Hooykaas, 1999, p. 154) and showed that Copernicus’s ideas actually did the opposite—elevating man from his previous Ptolemaic “earthly” position to a “heavenly” one. Showing the theological incompetence of these detractors, Hooykaas finished his analysis with an accurate assessment.

Man owed his high rank in creation to his being made in the image of God: the position of his dwelling place had nothing to do with this honorable stature. Indeed if it were true that the *central position* conferred dignity, Hell would have been the place most esteemed by the adherents of the geocentric system. For it, so they believed, was located in the centre of the Earth (Hooykaas, 1999, p. 155, emphasis in original).

Of course, a little logic would have done the same thing: Hubbert might have wondered why, if heliocentrism crushed Christianity, the chief scientists who developed the new astronomy—Copernicus, Galileo, Kepler, and Newton—remained devout Christians.

Similarly, mythology obscured the beginnings of geology from Hubbert’s view.

The second major scientific revolution is that which may be referred to as the Huttonian-Lyellian-Darwinian. During this, an earth with a presumed Biblical history of only some 6000 years, whose plant and animal inhabitants were initiated by Divine Creation, was supplanted by an earth the length of whose decipherable history was estimated to be at least hundreds of millions of years, and whose plant and animal inhabitants had evolved during those years from

ever more primitive ancestral forms. Man, instead of being God's highest and most favored Creation, was reduced to being a direct biological descendent, in common with all other members of the animal kingdom, of the long animal evolutionary chain (Hubbert, 1967, p. 3).

The errors in this statement would take a long discussion to point out completely. Suffice it to say, that a quick read through Rudwick (2005) will demonstrate that the traditional Biblical view of history had been rejected by the Enlightenment savants well back into the 1700s. In fact, de Luc noted that he was one of the only intellectual defenders of the Flood in the late 1700s, and his system did not even hold to a young earth.

Furthermore, Hubbert's emphasis on British geologists at the expense of the continental savants only illustrates the ongoing influence of Lyell's nationalistic bias. Gould (1975; 1987) laid bare the "empiricist myth" of Hutton, Playfair, and Lyell as the fathers of geology contra British "fundamentalists," propagated by apologists for scientism like Geikie, whom Hubbert liberally cited.

Sinking even deeper into Enlightenment propaganda, Hubbert attempts to conflate Werner's Neptunism and Genesis, going as far as to say that Werner's Neptunism "had an implied time scale which was compatible with Biblical chronology" (Hubbert, 1967, p. 9).

Rudwick (2005, p. 125) showed otherwise: "Likewise, Werner commented in print—casually and just in passing—that the Geognostic pile of rock masses must have accumulated 'in the immense time span...of our earth's existence.'"

Sticking to his paradigm of atheism's emancipation from the chains of Christianity, Hubbert also botched the debate between Hutton and Richard Kirwan, an Irish savant, whom Hubbert immediately accuses of having no personal knowledge of geology.

The attacks began as early as 1793 when the Irish chemist, Richard Kirwan, with no personal knowledge of geology, coupled the Wernerian system to a literal interpretation of the Bible in support of the charge of atheism against Hutton (Hubbert, 1967, p. 9).

This story is unmasked by Gould (1984, p. 13), who noted that "the textbook tale of uniformitarian goodies versus catastrophist baddies is a bit of self-serving, historically inaccurate rhetoric."

Then Rudwick (2005) fills us in on a more accurate version. He first credits Kirwan with being a "chemist and mineralogist" (p. 334), whose 1793 paper dealt with the supposed igneous origin of rocks. As Rudwick notes, Kirwan was courteous to Hutton, and "only briefly" referred to "the broader implications of Hutton's geothory" (Rudwick, 2005, p. 334). When he did, he attacked the philosophical eternalism of Hutton, not the "deep time" that we associate today with the geological timescale. This philosophical aversion was common to most European savants of that time—Christian or not.

As Rudwick (2005) notes later (pp. 335–336), it was only after the revolutionary terror in France that Kirwan—making an explicit link between geology and morality—asserted a more Biblical position in opposition to Hutton, whose model, though deistic in its theology, was rightly seen as promoting atheism. Though Rudwick deplores the subsequent development of scriptural geology in answer to Hutton and Lyell, it is clear in retrospect that Kirwan was prescient in understanding the broader implications of earth history without a Creator. Ironically, Hubbert completes Kirwan's argument by his illogical position of praising uniformity for overthrowing Christianity, while rejecting it on its logical merits!

But Hubbert is not finished mischaracterizing Neptunism:

Throughout its history the Neptunist-Vulcanist controversy was a mixture of geology and theology, and the central issue was the Huttonian versus the Biblical interpretation of geologic history (Hubbert, 1967, p. 10).

Rudwick (2005) first counters by distancing Neptunist geognosy from Werner.

Historians and historically minded geologists have commonly ascribed the Neptunist system to Werner (and many of them, until recently, routinely castigated him for it). But Werner was merely giving his own expression to a widely held kind of geothory (p. 175).

And as to Werner's supposed "theological" motivation, Rudwick (2005) notes,

He defined geognosy unambiguously as a branch of mineral natural history, concerned above all with the structural situation and spatial relations of rock masses. He firmly excluded "hypotheses," *for example about the origin of the earth*, arguing that such speculations were quite different from the sober inferences that followed directly from what could be observed (pp. 421–422, emphasis added).

Again, Hubbert could have deduced as much by researching the facts that: (1) Werner never published a "geothory," and (2) his views were quite conventional compared to other European savants; in other words, he accepted an indeterminately, yet not eternally, old earth.

So why did someone of Hubbert's caliber embrace these errors? Perhaps because he (like all too many others) developed a template of history based on his faith commitments to atheism. Facts were fitted to drive the story, not the other way around—a strange position for an "empiricist." It didn't help that he gained his historical information from propagandists like Geikie. As he started, so he ended:

In our historical review, we have traced a somewhat tortuous, but essentially unidirectional, progression toward emancipation from the idea that so-called natural laws could be set aside arbitrarily and terrestrial affairs manipulated at will by the dictates of a Divine Providence (Hubbert, 1967, p. 28).

In the 1960s, this view of Christianity was still seen as “scientific,” despite its theological inaccuracy and philosophical naiveté. Today, in retrospect, we can see unmasked commitments to materialism, evolutionism, positivism, and atheism. When we look at our increasing awareness of the complexity of real history, we can gain a greater appreciation for the work of the early creationists, who paved the way for modern views by challenging the arrogant scientism of their day. Today’s atheists are just as committed and outspoken as Hubbert, but more and more people are seeing the blatant religious bias that accompanies their “analysis,” thanks largely to the unremitting work of Christians who are unafraid to point out the obvious.

Errors of Philosophy

If Hubbert’s historical errors were significant, they pale beside his philosophical “analysis.” After praising uniformity for overthrowing Christianity, he claims that Lyell’s views were inconsistent and takes on the task of addressing the past. Although the following quote is somewhat long, it is quite revealing of Hubbert’s commitments.

Perhaps in answer to this we should consider what are the logical essentials in the deciphering of history, not just geological history, but any kind of history. Because it is impossible for us to observe anything except the present, our interpretations of prior events must necessarily consist of inferences based upon present observations. *History, human or geological, represent our hypothesis, couched in terms of past*

events, devised to explain our present-day observations.

What are our assumptions in such a procedure? Fundamentally, they are two:

- (1) We assume that natural laws are invariant with time.
- (2) We exclude hypotheses of the violation of natural laws by Divine Providence, or other forms of supernaturalism.

These are not arbitrary assumptions, nor are they peculiar to geologic science. Rather, they represent the distilled essence of all human experience, and are common to all sciences....

The second assumption is actually a corollary of the first, but it requires to be explicitly stated in view of the fact that for centuries the failure to accept this assumption has been one of the principle hindrances to the advancement of scientific understanding (Hubbert, 1967, pp. 29–30, emphasis in original).

Here, Hubbert’s view of history shows that his historiography has remained stubbornly a part of the scientific mindset, and this statement might well be made by a current geologist. The irony is that his two fundamental assumptions are *contradictory*!

While it is true that science rests on invariant natural laws, it is also true that the origins of science in Christian Europe lay in the ability of thirteenth- to seventeenth-century theologians to justify this sweeping assumption. They did so by linking it to the nature of God. It is essential that Christians avoid the trap of thinking that “invariant natural law” is not something intrinsic to matter and energy, but that it is the manifestation of what theologians call “Providence”—God’s ongoing involvement in His creation. All too often, we unconsciously accept the deistic formulation of God that when He created, He endowed matter and energy with “laws”

and walked away. In that paradigm, miracles become the divine “interfering” with creation decried by Hubbert. Instead, the founders of science were keenly aware that “wonders” were the norm—just the continued existence of anything was a “miracle.” Were God to withdraw His maintaining providence for even a moment, the universe would cease to exist.

It is only in the context of that Biblical view (Hooykaas, 1972; Glover, 1984) that the idea of invariant natural law can be secured and science can be settled. Enlightenment philosophers kept the uniformity but discarded the only logical basis for it. As Hume noted long ago, universal laws cannot be justified empirically because our observation does not reach across space and time in a manner sufficient to insure uniformity at all times in all places. This is especially true for someone who thinks the Earth is 4.6 billion years old.

Thus, when Hubbert leaps to his second assumption of discarding God, he fails to see that he has just “thrown out the baby with the bathwater.” The arrogance of his positivism is manifested in his following sentence, where contrary to Hume’s (and many others’) logical analyses, he asserts that these assumptions can be confirmed by “the distilled essence of human experience.” He then makes another error common to atheists: he claims both assumptions are a part of science. What he doesn’t realize is that rather than strengthening his assumptions, what he is doing is binding science to the altar of positivism, where it lays supine, waiting for the knife of logic to fall.

His arrogance is revealed again in his final paragraph. He sees the tenacity of human belief in God as if it were some psychological pest, clinging like a parasite to an evolving human race, rather than taking any time to wonder why so many people in so many places at so many different times have affirmed theism. As a confirmed atheist, he can-

not possibly accept the logical answer that it is because there really is a God who created the cosmos. And of course since others have discussed it at length, we need not waste too much time on the other obvious contradiction in his statement—for science is a child of Christianity alone.

To sum it up: the rise of science was not an extension of classical learning. It was the natural outgrowth of Christian doctrine: Nature exists because it was created by God. To love and honor God, one must fully appreciate the wonders of his handiwork. Moreover, because God is perfect, his handiwork functions in accord with immutable principles. By the full use of our God-given powers of reason and observation, we ought to be able to discover these principles (Stark, 2003, p. 157).

Conclusion

M. King Hubbert exemplified geology in the mid-twentieth century. It had a view of its own history built on Enlightenment propaganda rather than rigorous scholarship. It was aggressively atheistic and positivistic. Logic never stood in the way of its commitment to a world without God, and anyone with the temerity to question its many errors would have been informed that they were “unscientific”—a professional death

blow in a culture that still worshipped technology.

This was the world that welcomed *The Genesis Flood* in 1961 and the first manifestation of the modern creationist movement, the Creation Research Society, in 1963. Today creationists face a variety of challenges, but as this historical retrospective shows us, the opposition has always been there. Like our forefathers, we do not rely on our intellect, our cleverness, or our skill in debate. We simply rely on the promise of God in 1 Corinthians 1:27 (KJV):

But God hath chosen the foolish things of the world to confound the wise; and God hath chosen the weak things of the world to confound the things which are mighty.

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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.

Proving Ropen

There are techniques that would record accurate proof of living pterosaurs. The evidences stated by “Reports of Living Pterosaurs in the Southwest Pacific,” by Jonathan D. Whitcomb (CRSQ 45:200–212), and by others, merit further investigations. Portable telemetry equipment could be designed, perfected, and placed in locations of multiple ropen sightings, mostly clear of trees. Camouflaged and automated equipment would silently detect, locate, and track ropen suspects, by both visual and audio telemetry. Equipment would be placed in sets and radio interconnected, so as to triangulate a suspect. Triangulation could generate 3-D perspective during portions of a sighting. Motion detection and tracking requires non-harmful and physiologic non-stimulus energies. Miniature, low-energy coherent UHF radar would be best but might be difficult to obtain or

fabricate. Miniature microwave motion detection might be adapted. Distance might be extended by fitting coherent emitters. Microwaves stimulate physiologies, so microwaves might be rapidly pulsed. That could prevent cellular microwave accumulation thresholds and consequent physiologic stimulation and reduce harm. Equipment could be at-site solar recharged. Twelve equipment sites per set, for example, might cover a reported sighting location for 3–12 months and then be moved to another location. Equipment should be designed to be adaptable to similar surveillances and telemetry of other natural creatures in other environments, including placements upon elevated, small-diameter, guyed columns.

Planning for ropen surveillances should first acquire formal agreements and legal permissions by the national,

regional, and local governments, and the other relevant authorities, including religious authorities. Perpetuate active agreements, with specific improvement process arrangements, and laws with complete facilitation capacities should be accomplished to entirely protect ropen pterosaurs’ individual lives, their essentials for living, and their wholesome natural-aesthetic habitat areas and ecological conditions. Sincere regard should be invoked and maintained for their comfort, health, and happiness—and for the wisdom and whole counsel of God their Creator, concerning carefully keeping them ... if they are proved discovered.

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Lunar Recession: A Gravitational Decompression-Induced Genesis Flood-Related Phenomenon

Don DeYoung (2008) discusses earth tides caused by the moon's gravitational influence, the consequent slow-down of the earth's rotation rate, the consequent lunar recession rate, and estimates of the age of the moon as determined from its recession rate and notes that the current recession rate of the moon from the earth, as accurately measured by laser ranging to reflectors placed on the moon during the 1969–1972 Apollo missions, is 3.82 ± 0.07 cm/yr (Cartwright, 1999).

Jonathan Henry (2006) also discussed estimates of the moon's age as determined from its recession rate, and both Henry and DeYoung note that estimates of an upper limit on the moon's age of about 1.3 Ga, using the current lunar recession rate of 3.82 cm/yr, fall far short of the presumed age of the earth-moon system of 4.6 Ga.

Henry and DeYoung both discuss the efforts of secular theorists to resolve this discrepancy, with Henry noting that one response by some secular theorists, in an effort to “*save conventional lunar chronology*,” has been to “*minimize the lunar recession rate*” (Henry, 2006, pp.68, emphases added). Henry also notes that Lambeck suggested “only a variable energy sink can solve the time-scale problem and *the only energy sink that can vary significantly with time is the ocean*” (Lambeck, 1980, p.288, emphasis added) and that Bowden noted “*particularly the Americas which are strung out from north to south across the path of the tides are responsible for a high energy dissipation rate*” (Bowden, 2002, p.3, emphases added).

DeYoung too, notes that some secular researchers, in “a desperate attempt to preserve the assumed 4.6 billion year age for the moon” assume that “*the current value of lunar recession, 3.82 cm/yr, must be anomalously high*” and suggests that “at some point, the moon underwent a

sudden speed up in its outward motion” (De Young, 2008, p.104, 105, emphases added).

Henry notes, “The *primary cause* of lunar recession is ...*the tides of the earth's oceans*” (Henry, 2006, p.68, emphasis added), indicating thereby that there are other components of the lunar recession, which are not due to tidal interaction with the earth's oceans. DeYoung lists “unknown frictional effects, continental drift, fluid core motion of the earth, ice distribution, and solar activity” as other possible causes of earth rotational slowdown and consequent lunar recession (DeYoung, 2008, p.105). The causes and magnitudes of these other components of the lunar recession rate are difficult to establish and quantify, but they are probably minor compared to the primary tidal component.

Nicolson (1981) noted that the increase in the moon's orbital period due to *tidal interaction with the earth* is about 12.5 parts per 10^{11} per year and that the increase in the moon's orbital period due to *all causes* is about 22 parts per 10^{11} per year. Thus, assuming a relationship between the moon's orbital period and its recession rate, an additional “*excess*” lunar recession rate, which is not due to tidal interaction with the earth and the other minor causes noted by DeYoung, might be inferred.

Secular theorists have long speculated that such an “*excess*” lunar recession rate may be evidence for the decreasing strength with time of G , the *Universal Gravitational Constant* (Van Flandern, 1981; Wesson, 1980). DeYoung however, after reviewing attempts by secular theorists to prove variation of G , which included studies of the lunar recession rate, noted that “*experiments to determine a change in the value of G have thus far been unsuccessful*” (DeYoung, 1990, p.131, emphasis added).

A remnant, small continuing “*excess*” lunar recession rate would result from a sudden temporary reduction, and subsequent full restoration, of the gravitational force. A reduction of gravitational force, which I have proposed initiated the Genesis Flood (Hunter, 2000a, 2004b), and three other factors, which, during the Flood, would be consequent thereupon, as discussed below, may have initiated lunar recession or caused “*a sudden speed up in [the moon's] outward motion*” (DeYoung, 2008, p.105, emphasis added).

1. Gravitational Decompression

In 2000 DeYoung noted that the exponent of the separation distance (r) in Newton's universal gravitational law (Newton, 1687) is exactly 2 and that “*if the exponent deviated just slightly from exactly 2, planet orbits and the entire universe would become unstable*” (DeYoung, 2000, p.44, emphasis added). Thus an immediate effect of a temporary reduction of gravitational force, effected by an increase of the value of the r -exponent, would have included, among other things, recessions of all orbiting bodies in the universe.

Also in 2000, I proposed a gravitational decompression model of initiation of the Genesis Flood (Hunter, 2000a), speculating that the Flood was initiated by a sudden, temporary decompression of the earth, consequent upon a temporary reduction, by God, of the magnitude of the universal gravitational constant (G). In retrospect, and especially in view of DeYoung's reminder of “*the seriousness and the implications of challenging science with respect to the values of the basic constants*” and his admonition that “it should never be done lightly or in an *ad hoc* way to solve present problems” (DeYoung, 1990, p.130, emphases added) publication of this hypothesis,

insofar as it advocated a reduction of G , was ill-considered.

Assuming that God set the universe up such that all masses within the universe would interact gravitationally with each other according to Newton's subsequently discovered universal gravitational law, we might reasonably assume that, having thus set the universe up, God would be easily able to change these relationships if and when required. Because gravitational force reduces exponentially with increased r -exponent of the universal gravitational law (Figure 1), a more effectual gravitational decompression, with the same mantle differentiation and astrophysical effects, would have been achieved by increasing the value of the r -exponent from 2 to $2 + n$ (where n is as yet undetermined). An increase of just 2% in the r -exponent to 2.04 would halve the gravitational force throughout the universe (Figure 1).

Such a universal gravitational decompression, I postulated, initiated the

Genesis Flood by bringing the earth's mantle to its melting temperature, resulting in mantle melting and differentiation with consequent exsolution of water from the mantle and formation of the present continents. The gravitational force was, I postulated, partially restored on Day 40 of the Flood, stopping the "*fountains of the great deep*" and possibly the "*windows of heaven*" and fully restored on Day 150, initiating the down-faulting of the ocean basins.

It is easy to demonstrate, as follows, using Newton's universal gravitational law, that a small remnant, continuing "excess" lunar recession rate would result from a temporary reduction and subsequently staged full restoration of the gravitational force during the Genesis Flood.

Assume the moon orbiting the earth at the created separation distance r_c at the end of Creation Week. The attractive force F_c between the earth and the moon is given by Newton's universal

gravitational law as: $F_c = G_c m_e m_m / r_c^2$ (where: F_c is the attractive force between the earth and the moon at the end of Creation Week, G_c is the created universal gravitational constant, m_e and m_m are the masses of the earth and moon respectively, and r_c is the separation distance between the earth and the moon at the end of Creation Week).

If, at the initiation of the Genesis Flood, the exponent of r_c is suddenly, temporarily, increased from 2 to say 2.010, the gravitational attractive force between the earth and the moon is reduced and now given by $F_{f1} = G_c m_e m_m / r_{f1}^{2.010}$ (where $f1$ is Flood Day 1 and $r_{f1} = r_c$). Because of the now reduced attractive force due to the larger r exponent, the moon's orbit would begin to spiral outward, increasing the separation distance to r_{f40} after 40 days (where $f40$ is Flood Day 40). The gravitational attractive force between the earth and the moon at Day 40 is now given by $F_{f40} = G_c m_e m_m / r_{f40}^{2.010}$.

If, then, on Day 40, the exponent of the separation distance r is partially restored, to say 2.005, the attractive force between the earth and the moon is now given by $F_{f40} = G_c m_e m_m / r_{f40}^{2.005}$ (where $f40$ is Flood Day 40), which, due to the now increased radius (from r_c to r_{f40}), and to the larger r exponent, is less than the original created attractive force F_c . The partially restored gravitational force then would not be sufficient to completely arrest the outward spiralling increase in the moon's orbital radius initiated by the change of the value of the exponent of the separation distance from 2 to 2.010. Thus, in addition to lunar recession induced by tidal interaction with the earth, the moon would have an "excess" recession rate which would be considerably reduced from that due to the temporarily reduced gravitational force between Day 1 and Day 40.

If, then, on Day 150, the exponent of the separation distance r is fully restored to its original created value of 2, the attractive force F_{f150} is now given by

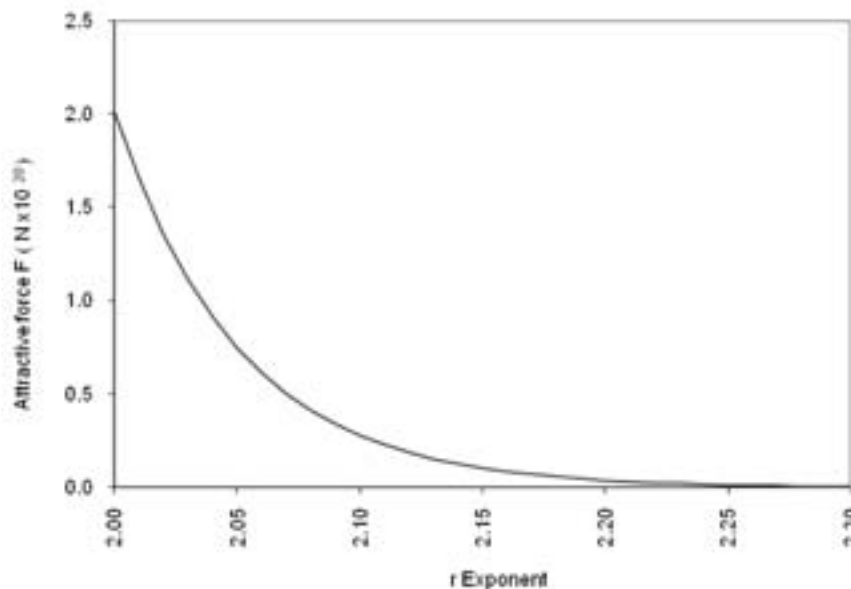


Figure 1. Gravitational attractive force F between the earth and the moon vs. r exponent. From Newton's universal gravitational law ($F = G m_1 m_2 / r^2$), where F is the gravitational attractive force between the earth and the moon, G is the gravitational constant, m_1 and m_2 are the masses of the earth and the moon respectively, and r is the separation distance between the earth and the moon.

$F_{f150} = G_c m_c m_m / r_{f150}^2$ (where r_{f150} is Flood Day 150), which, because of the further increased separation distance (from r_{f40} to r_{f150}), is still less than the original created attractive force F_c , and so an “excess” lunar recession rate will continue.

In addition to, and consequent upon, the postulated reduction of gravitational force at the initiation of the Flood described above, there are three other phenomena, which, during the Flood, would have contributed significantly to lunar recession.

2. Rapid Redistribution of Mass from the Earth’s Mantle to Its Surface during the Flood

In the gravitational decompression Flood model, decompression-induced melting and differentiation of the earth’s mantle, probably during the first 40 days of the Flood, resulted in the outward redistribution of molten rock to the earth’s surface, initially as ultramafic and mafic volcanics in the Precambrian shield areas which now form the cores of continents, with a consequent small increase in the earth’s diameter of 95–100 km (Hunter, 2000a, p.66). The outward movement of mass would have caused a slowing of the earth’s rotation rate, with a consequent speed up of lunar orbital velocity and consequent increase of the lunar recession rate.

3. Rapid Addition of a Large Volume of Water to the Earth’s Oceans during the Flood

As noted by DeYoung and Henry, the primary cause of lunar recession is the gravitational interaction of the moon with the water of the earth’s oceans. During the Flood, probably during the first 40 days, a significant volume of water was rapidly added to the earth’s oceans, from the mantle (“*fountains of the great deep*”) and from above (“*windows of heaven*”) (Hunter, 2000b). The

rapid addition of a large volume of water during the Flood would have caused a sudden increase in tidal resistance, with a consequent sudden slowing of earth rotation rate and consequent increase of the lunar recession rate.

4. Rapid Formation of the Present Continents during the Flood

We might reasonably assume that lunar recession constitutes a very minor imperfection in the solar system, which may not conform to the “*very good*” description of the finished creation on Day 7 of Creation Week (Gen. 1:31). It is then perhaps conceivable that the configuration of the pre-Flood seas and land, established on Day 3 of Creation Week (Gen. 1:10), may have been such that, during the antediluvian period, there was little or no lunar tidal interaction with the earth’s seas, and thus little or no lunar recession.

In the gravitational decompression model *the Americas*, with Africa, Australia, and Eurasia, were all formed during the Genesis Flood by differentiation from the earth’s mantle (Hunter, 2004a) and all are, in effect, “*strung out from north to south across the path of the tides*” (Henry, 2008, p.69, emphasis added; cf. Bowden, 2002, p.3). The rapid formation of the continents by mantle differentiation, probably during the first 40 days of the Genesis Flood (Hunter, 2004a), would have caused a sudden increase in tidal resistance, with a consequent sudden slowing of earth rotation rate and consequent increase of the lunar recession rate.

Conclusion

In consideration of the four factors discussed above, most or all of the current lunar recession rate may have been initiated during the Genesis Flood. Some may consider this conclusion interesting but somewhat speculative, but, as Williams (2004) described science, it is “*a combination of observation and theory*

that leads to testable predictions” (Williams, 2004, p.50, emphasis added). Confirmatory evidence for gravitational decompression-initiated “excess” lunar recessions may exist, for instance, in the orbits of planetary satellites such as Phobos and Deimos, which orbit Mars, which has no oceans and little atmosphere and thus provides little or no tidal resistance to orbiting satellites.

A temporary gravitational decompression would have had other effects throughout the solar system and the universe. Such effects may include recessions of all orbits, decompression-induced melting and differentiation of the mantles of planets and planetary satellites, melting and explosive fragmentation of a small planet to produce the asteroids and possibly comets, and explosion of stars to produce super novae.

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Symmetric Variation and Natural Selection

The environment produces conditions within which life exists, and symmetric variation produces the genetic changes in accordance with the environment. Nature selects which changes will survive from the palette of symmetric variation. However, in the case of gene duplication there is a remarkable difference. In an experiment (Calder, 1973), bacteria were fed on synthetic alcohol, and the gene involved broke down the substance to an extent. Nevertheless, more suitable genes were needed to do a more complete job.

The original or parent gene duplicated and these copies could mutate freely, as natural selection was not policing them; rather it was keeping an eye on the gene that was having some success in breaking the substance down. In time, these copies produced genes better fitted to the job.

What produced the changes by way of mutations is covered by the rules laid down by the way symmetric variation works (Brown, 1999 and 2000). Here, mutations either produce the same amino acid (hence the term “symmet-

ric,” a term I prefer to “silent,” as the latter would imply nothing has happened) or mutate to produce another amino acid, which may even be outside the group of the originals. One of the UK's top mathematicians supports this view (Stewart, 1994).

The life-form's repair system would normally return unwelcome changes back to their symmetric state, but no harm will come to these freely mutating copies because the bacteria already has a functioning gene. Symmetric variation does this work by itself, without the intervention of natural selection.

So, in this case natural selection is overruled. Darwin once said that natural selection would not come into effect in those situations that did not produce benefit or harm (Darwin, 1998, p.68). However, Darwin would not have expected any of these situations to *become* good without natural selection—I wonder what he would have said about this situation!

Gene duplication is a useful tool for creation. As we have seen, it can overcome difficult circumstances where

mutations of just one gene are unable to cope. Nevertheless, this one original gene, with what function it does possess, could act as a guide to the mutating copies, thus aiding things to go in the right direction.

Symmetric variation is, I believe, the major reason why life-forms remain within their respective kinds.

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Book Review



Extinction of Evolution

by Darek Isaacs

Watchmen 33, Jacksonville, AL, 2009, 167 pages, \$13.00.

What would happen if the logic behind the theory of evolution, as advocated by “new atheists” like Richard Dawkins, were fully implemented and lived out in our culture? That intriguing question serves as the premise for this book by first-time creationist author Darek Isaacs. *Extinction’s* highly provocative (and humorous) answer to the question in this part fiction, part nonfiction publication is provided by rabidly evolutionary professor, Dr. Iman Oxidant, a fictional composite of “enlightened” souls like Dawkins who believe in philosophical materialism, the extremist view that if it can’t be measured by science it doesn’t exist, or that the universe consists of nothing but physical matter. Oxidant represents Darwinism taken to its logical conclusion. A brilliant invention, the good doctor, who does not lack for ego, treads boldly where only angels (or, in this case, demons) would dare to go, fearlessly spewing out what other, less honest, evolutionists would never utter publicly but must believe if they are true to their convictions.

The fictional part of the book consists of a series of Internet seminars Oxidant (who may remind some of the senior demon in C. S. Lewis’s *The Screwtape Letters*) delivered for the

“Institute for Progressive Lineage” before his tragic death, admonishing his students to embrace evolution in all its glorious fullness and be brave enough to live it out. Contrary to his colleagues, who often seek to downplay or deceive people about the practical implications of Darwinism, true believer Oxidant knows that a genuine understanding of evolution eliminates the possibility of God and thus sees no reason not to speak openly about it. Thus, as defined by his “Four Sub Laws of Evolution,” drawn directly from statements made by Darwin, Oxidant proceeds to spell out, in frighteningly stark terms, the effects a fully realized ideology of evolution would have on our world.

Among the topics Oxidant covers is evolution’s inherent racism, as suggested by the oft-ignored subtitle of Darwin’s *Origin of Species—Or the Preservation of Favored Races in the Struggle for Life* and which Darwin spelled out in other works. Obviously, Darwin thought himself a member of the most favored race—the white race—which, if he didn’t say so himself, was more prosperous and produced more intelligent (and even better looking) offspring than other “lesser” races. And, since evolution is based on the survival of the fittest, to Oxi-

dant it’s a no-brainer that not only should inferior species, such as the negroes of Southern Africa, Australian aborigines and South American “Fuegians,” as specifically mentioned by Darwin, be prevented from “breeding” but also that the superior races have an explicit evolutionary mandate to eliminate them.

Oxidant goes on to argue that since there is obviously no God and man clearly evolved from animals, all religions are bogus inventions, especially Christianity, and that the concepts of sin, much less the need for a Savior, like Jesus, need to be discarded. Under evolution there is no right or wrong, and man is free to use his brains and brawn in any way that will give him an advantage in the struggle for existence (passing along his genes). For that matter, since, according to Darwin, women are inferior to men physically and mentally, evolution dictates that they have no say in matters of sex. They simply exist to be “bred” at the earliest feasible age and as often as possible by any men who have the ability to do so. Marriage, like religion, is a false construct that simply serves to prevent men from spreading their genes, and since there is no such thing as sin, rape is just fine as far as evolution is concerned. Of course, in this scenario things like

adoption make absolutely no sense, not to mention mercy, compassion, forgiveness, feeding the poor, or loving your enemy. Indeed, Oxidant argues, for the sake of the planet, evolution demands a “culling of the herd”; that is, the human population, through abortion, euthanasia, and other necessary means in order to remove the weak, the feeble, and the unproductive.

While Dr. Oxidant is a fictional creation, Isaacs makes it clear that the negative effects of evolutionary thinking, however obscured for public consumption, are all too real. Viewing people as soulless animals is clearly the belief of environmental extremists who view human beings as little more than “parasites” on the earth. An evolution mindset is also clearly behind the push for abortion and euthanasia. If the book had come out today, it would no doubt have included the hot topic of government-

rationed health care with its specter of “death panels.” Isaacs also draws the connection between evolution and the (past and future?) eugenics movement, as well as the atrocities committed by Hitler, the embodiment of evolution’s “ultimate leader,” the Holocaust notwithstanding. Isaacs writes, “Hitler...did nothing wrong if measured by the standards of natural selection. Based on the survival of the fittest, the strong have every right to exterminate, extinguish, sterilize, rape and murder the weak” (p. 139). And, of course, under evolution homosexuals would be “bred out” of existence.

Isaacs goes on to state that facts alone will never defeat evolution because evolution is really not science or based on science. Like Dr. Oxidant, it is a made-up fiction that makes great claims for itself and provides a “respectable” rationale for those who wish to remove God from their lives. That seeking to impose

this godless ideology on society would only produce a literal hell on earth does not seem to faze these folks. However, Isaacs’s well-reasoned book, which ends with a presentation of the gospel, makes it clear that this is exactly the dark path to which Darwinism leads.

Highly readable and thought provoking, *The Extinction of Evolution* is a surprisingly powerful book from a young author. If this debut publication is any indication, Darek Isaacs represents a dynamic, new voice in the battle against evolution, and I wouldn’t be surprised if we hear more from him in the days ahead. I would highly recommend *Extinction* to creationists, and I would recommend it as a witnessing tool, like *Mere Christianity*, to pass along to evolutionist friends.

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Electronic submissions of all manuscripts and graphics are preferred and should be sent to the editor of the *Creation Research Society Quarterly* in Word, WordPerfect, or Rich Text Format (see the inside front cover for address). Printed copies also are accepted. If submitting a printed copy, an original plus two copies of each manuscript should be sent to the editor. The manuscript and copies will not be returned to authors unless a stamped, self-addressed envelope accompanies submission. If submitting a manuscript electronically, a printed copy is not necessary unless specifically requested by the *Quarterly* editor. Manuscripts containing more than 35 pages (double-spaced and including references, tables, and figure legends) are discouraged. An author who determines that the topic cannot be adequately covered within this number of pages is encouraged to submit separate papers that can be serialized.

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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.

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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.

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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.

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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.

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.

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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.

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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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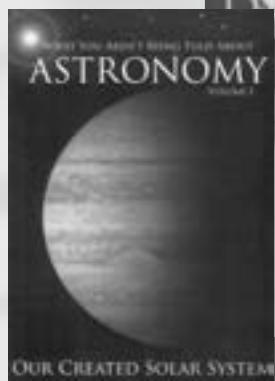


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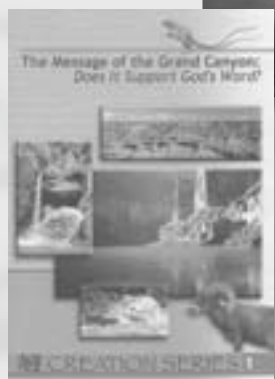


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