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Haec Credimus

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

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Local Catastrophes or Receding Floodwater? Global Geologic Data that Refute a K-Pg (K-T) Flood/post-Flood Boundary

Timothy L. Clarey*

Abstract

Five major arguments are put forth that challenge the K-Pg boundary as the Flood/post-Flood boundary: (1) the presence of the Paleocene Whopper Sand in the Gulf of Mexico, (2) the tremendous amount of Cenozoic sediment deposited globally, (3) the fact that the thickest and most extensive coal seams are found in Cenozoic sediments globally, (4) the identification of uninterrupted carbonate deposition across the K-Pg boundary upward through Miocene strata across North Africa and the Middle East, including Iraq, and (5) the tremendous amount of rapid ocean crust/seafloor spreading that continued right across the K-Pg boundary and through much of the Cenozoic up to the Pliocene, with no indication of a significant change in velocity. These data collectively establish that the Flood/post-Flood boundary had to have been much higher in the Cenozoic rock record, at least as high as the top of the Miocene. The Tertiary (Paleogene and Neogene) likely represents the receding-water phase of the Flood. The results of this paper also call into question much of the claimed paleontological evidence for a K-Pg Flood/post-Flood boundary, including the evolution-saltation process that has been recently proposed.

Introduction

Determining the boundary surface that marks the end of the Flood is extremely important in any Flood model. It is generally assumed that there should be significant changes in both stratigraphy and fossil content across this boundary. Over the years, various stratigraphic levels have been suggested as the level marking the end of the Flood, but no consensus has been reached. Some early creationist authors suggested that all the Tertiary (Paleogene and Neogene) strata were late Flood deposits (Whitcomb and Morris, 1961; Coffin and Brown, 1983). Most mid-nineteenth-century scriptural geologists (SG) also believed all Tertiary rocks were part of the Flood record and did not attribute them to the post-Flood period (Johns, 2016). The only SG who argued the Tertiary was post-Flood was Frederick Nolan (Johns, 2016), who, in 1833, claimed the Tertiary consisted of a series of local catastrophic deposits. This view, of small, localized or regional post-Flood deposits, is the same concept

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being promulgated by many prominent creation geologists today (Austin et al, 1994; Ross, 2012, 2014a, 2014b; Wise, 2002; Whitmore, 2006).

A major shift in thought occurred, at least among many creation geologists, when Austin et al. (1994, p. 614) defined the Flood/post-Flood boundary in their catastrophic plate tectonics (CPT) paper:

> For our purposes here we would like to define the Flood/post-Flood boundary at the termination of global-scale erosion and sedimentation. Based upon a qualitative assessment of geologic maps worldwide, lithotypes change from worldwide to continental in character in the Mesozoic to local or regional in the Tertiary. Therefore, we tentatively place the Flood/post-Flood boundary at approximately the Cretaceous/Tertiary (K/T) [now the K-Pg] boundary. We believe further studies in stratigraphy, paleontology, paleomagnetism, and geochemistry should allow for a more precise definition of this boundary.

This definition was included in the catastrophic plate tectonics paper almost as an addendum, failing to achieve a complete consensus even among the coauthors (J. Baumgardner, personal communication, 2017). Although determined "tentatively," this definition became entrenched soon thereafter as near "fact" in a large segment of the creation geology community (Wise, 2002; Whitmore and Wise, 2008; Whitmore and Garner, 2008; Whitmore, 2013; Ross, 2012, 2013, 2014a, 2014b; Snelling 2009, 2014a; Ross et al., 2015). Other authors, like Oard (2006, 2007, 2010a, 2010b, 2011, 2013a, 2013b, 2016a, 2016b, 2017a, 2017b), Baumgardner (personal communication, 2017) and Holt (1996), have disagreed with this interpretation, placing the Flood/post-Flood boundary much higher instead. Snelling (2010), to his credit, recognized the need to raise the boundary higher locally in Israel as

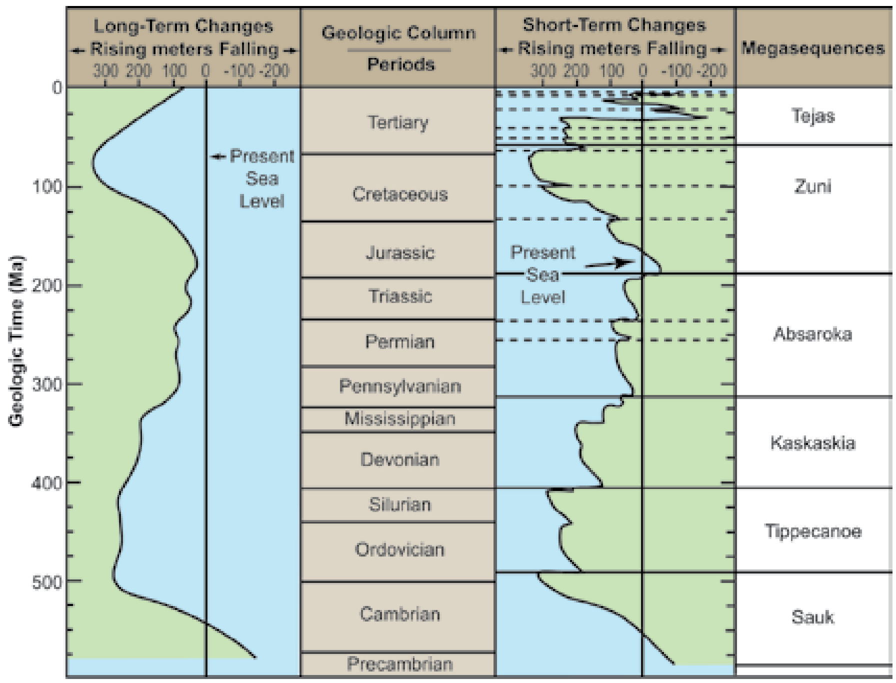


Figure 1. Chart showing the secular timescale, presumed sea-level curve, and the six megasequences (modified from Snelling, 2014c). The Tertiary system is now composed of the Paleogene and Neogene systems. The Quaternary is not shown.

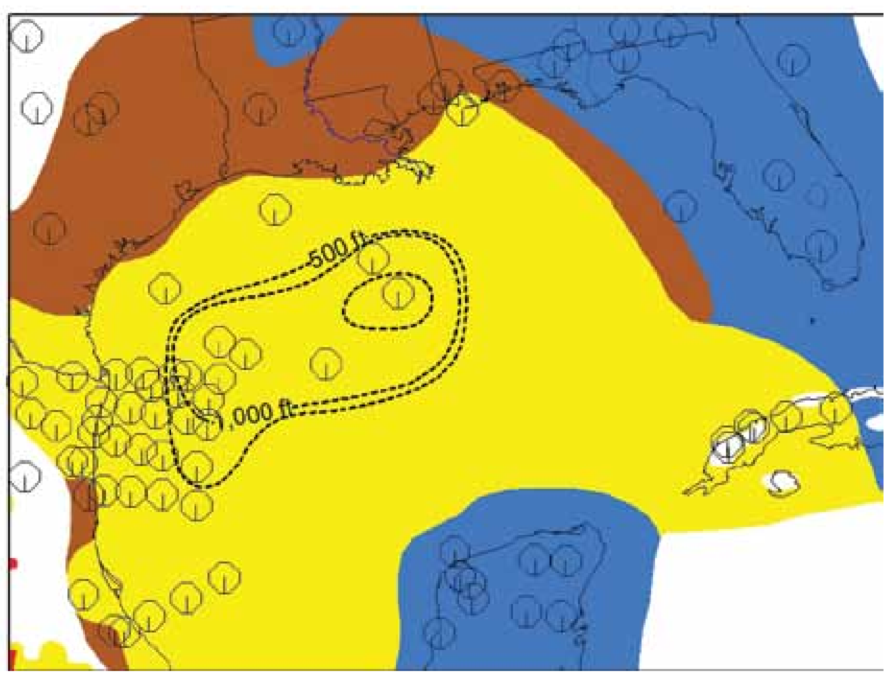


Figure 2. Map of the basal Tejas lithology showing the extent and thickness of the "Whopper Sand" in the Gulf of Mexico (Paleocene Lower Wilcox SS). 500 ft = 152 m, 1000 ft = 305 m, 1500 ft = 457 m. Yellow represents sand, blue represents limestone, and brown represents clay/shale. State outlines are shown for reference. Circles represent stratigraphic columns used in this study. © 2017 Institute for Creation Research. Used by permission. Diagram courtesy of Davis J. Werner.

he found continuous carbonate deposition from the Cretaceous through the Oligocene (Upper Paleogene), placing the Flood/post-Flood boundary at the top of the Oligocene in Israel.

Snelling (2014a, p. 178) has previously pointed out that a "biostratigraphic break expected to characterize the Flood /post-Flood boundary" was never identified at the Pliocene/Pleistocene level. He used this to argue in favor of a K-Pg Flood/post-Flood boundary instead. However, the more recent discovery of a sixth global extinction event at the top of the Pliocene makes Snelling's argument less compelling (Pimiento et al., 2017). Indeed, Pimiento et al. (2017) found that 36% of Pliocene genera failed to survive into the Pleistocene and that extinction rates were three times higher in the Late Pliocene relative to the rest of the Cenozoic. This discovery of a hitherto unrecognized global "break" in fossil content (known as a paleontological discontinuity) calls for reevaluation of some of the rationale used to define the Flood/post-Flood boundary.

Furthermore, Snelling and Matthews (2013) determined the time between the end of the Flood and the onset of the Ice Age (Pleistocene sediments) was about 100 years (Clarey, 2016a). Therefore, advocates for a K-Pg end of the Flood must assume that all of the Tejas megasequence (Paleogene and Neogene), which includes most of the Cenozoic, was deposited in about a century of time.

Sanders (2009) attempted to stretch the period of time between the Flood and the Ice Age to between 102–315 years. However, his arguments were based largely on Pleistocene-age human fossils and attempts to tie them to the life span of Peleg and passages about Babel in the Bible. He apparently did not consider the timing of ice build-up and the onset of the Ice Age as did Snelling and Matthews (2013) and Clarey (2016a). Sanders (2009, pp. 67–68) concluded by stating:

> Admittedly these estimates are mathematically unsophisticated and geologically naïve, but I believe they are reasonable enough to properly bracket the dates of interest and provide consistent comparisons for the purposes of this paper.

Regardless of whether it is 100 years or 300 years, this time span severely limits the amount of catastrophic activity possible and the number of generations possible, especially for the largest mammals. Recently, Wise (2017) has even used this limited amount of time to justify major evolutionary jumps, which he calls saltation, to explain the Cenozoic mammal record.

Surprisingly, the K-Pg interpretation for the Flood/post-Flood boundary has never been adequately tested through large-scale stratigraphic studies. Most of the claims of "proof" that the K-Pg represents the end of the Flood have come from studies of paleontological data (Ross, 2012, 2014a; Wise, 2009; Whitmore and Wise, 2008) and/or local studies of individual units like the Green River Formation (Whitmore, 2006) and Israel (Snelling, 2010).

The goal of this paper is to reexamine the geology of the Tertiary system, now known collectively as the Paleogene and Neogene systems, on a more global scale and address the validity of a K-Pg Flood/post-Flood boundary in light of new and available geologic data. Hopefully, this paper will help to answer the central question: Are the geologic features of the Tertiary (Neogene and Paleogene) system better explained by local catastrophes or by the large-scale effects of the receding-water phase of the Flood?

Methods

Some of the geologic data was generated as part of an ongoing research project at the Institute for Creation Research, termed the Column Project. Stratigraphic columns were compiled from published outcrop data, oil well boreholes, cores, cross sections and/or seismic data tied to boreholes. Other data come from published reports by various authors. Lithologic and stratigraphic interval data (megasequence boundaries) were entered into a database, allowing the creation of a three-dimensional lithologic model for each of the three continents in this study. These models also allow the correlation of rock types within individual megasequences and along their bounding surfaces. The megasequences and their relation to the secular timescale are shown in Figure 1.

Our database consisted of selected COSUNA (Correlation of Stratigraphic Units of North America) (Childs, 1985; Salvador, 1985) stratigraphic columns across the United States, stratigraphic data from the *Geological Atlas of Western Canada Sedimentary Basin* (Mossop and Shetsen, 1994), and numerous well logs and hundreds of other available online sources. Using these data, we constructed 710 stratigraphic columns across North America, 429 across Africa, and 405 across South and Central America from the pre-Pleistocene, meter by meter, down to local basement. We input detailed lithologic data, megasequence boundaries, and latitude and longitude coordinates into RockWorks 17, a commercial software program for geologic data, available from RockWare, Inc. Golden, Colorado, USA. We classified each column, meter by meter, according to 16 rock types. Depths and thicknesses shown in all diagrams are in meters.

Each column includes the complete record of sedimentary rocks at that location from surface to crust along with the corresponding Sloss (mega) sequence boundaries (1963). Any erosional "gaps" in the COSUNA columns were collapsed so that only the rocks present at each location were used in the study.

Megasequences were used in this study because, while not entirely independent of the fossil record, they do reflect major shifts in depositional patterns as the seas transgressed and subsequently regressed off the continents. Many of these shifts left behind erosional surfaces at the top and base of the megasequences and changed the rock type abruptly (called xenoconformities; Carroll, 2017a). These major shifts in depositional architecture are recognizable and traceable across continents and offshore alike using distinctive characteristics observed on seismic reflection records, such as abrupt truncations and strong reflecting horizons.

Results and Analysis

This paper presents five geologic arguments that defy a local catastrophic explanation. Some of these features are so large and/or unusual in scale that local catastrophes could not conceivably produce them. Others demonstrate geologic conditions that could have existed only while the Floodwaters were still covering large portions of the continents. Collectively, they severely damage the claim that the Flood ended at the stratigraphic level of the K-Pg boundary.

1. The Whopper Sand

During the course of our intercontinental studies, we came across the recent discovery of a large, unusually thick and extensive sand body in the deep water of the Gulf of Mexico. This sand was so large and completely unexpected that the oil industry dubbed it the "Whopper Sand" (Higgs, 2009).

The Whopper Sand is part of the Lower Tertiary exploration "play" or target zone in the Gulf of Mexico (GOM) (Techentien et al., 2017). The sand layer is part of the Paleocene-Eocene Lower Wilcox Formation. What makes the Whopper Sand unusual is its location in deep water, nearly 200 miles (300 km) from the Lower Wilcox shelf margin and far from any conventional sand source (Higgs, 2009). Secular geologists consider the Whopper Sand to be part of an extensive system of sheet sands deposited in a regional basin floor fan system (Techentien et al., 2017) but cannot seem to explain its unusual thickness or great extent (Lewis et al. 2007).

Since 2001, with the drilling of the BAHA-2 well, billions of barrels of oil have been discovered in the Paleocene-Eocene Wilcox-equivalent Whopper Sand (Higgs, 2009). This well reportedly encountered 1100 feet of sand in the Lower Wilcox in over 7000 feet of water within the Perdido Fold Belt of Alaminos Canyon. In Keathley Canyon, the Sardinia-1 well encountered over 1200 feet of sand and in Walker Ridge, the Jack-2 well and Chinook and Cascade-2 wells reached similarly thick Lower Wilcox sands approaching 1900 feet thick (Trammel, 2006). Average porosity in the Whopper Sand is 18%, and permeabilities range from 10–30 millidarcys (Trammel, 2006). Up to 15 billion barrels have been discovered in this trend since 2001 (Figure 2).

Two competing secular interpretations have been suggested to explain the presence of the Whopper Sand, one by Higgs (2009) and Sweet and Blum (2011), and a second model supported by Berman and Rosenfeld (2007), Rosenfeld and Pindell (2003), and, more recently, Cossey et al (2016).

Berman and Rosenfeld (2007), Rosenfeld and Pindell (2003), and Cossey et al (2016) argue for the "GOM drawdown hypothesis," where the Gulf of Mexico became isolated from the open Atlantic Ocean by the closure of the Florida straits. These authors have suggested a drop in sea level in the center of the GOM of well over 200 m in order to transport the Whopper Sand into its deepwater position.

Higgs (2009) and Sweet and Blum (2011) have counterargued that the lack of evaporite-type deposits within the stratigraphic interval precludes this interpretation, claiming the evidence for a major drop in sea level is lacking. Higgs (2009) has countered with a more traditional river transport interpretation with drops in sea level of more modest values (100 m) to explain the Whopper Sand and the deepwater canyons. Instead of evaporative drawdown as called on in the first model, Higgs (2009) believes sustained river flow into the lowered GOM exceeded evaporation, lowering the salinity and turning the GOM into a brackish lake. Sweet and Blum (2011) have proposed a less extreme model and advocate more traditional long-distance river flow to explain the Whopper Sand.

However, critics argue the "river model" still does not address the high purity (70% sand) and the thickness (>1000 feet) of the Whopper Sand. Rivers today mostly transport clays, with minimal silts and even sands out into deep water.

Research by Blum and Pecha (2014) may help provide an answer to how the Whopper Sand formed in deep water. These authors used detrital zircons to map out the direction of drainage in the Cretaceous and in the Paleocene across North America. They determined that the drainage patterns shifted dramatically between these two depositional episodes (Figure 3).

These authors found that during deposition of the Cretaceous (Zuni Sequence), the drainage pattern was dominantly to the north and northwest across much of the USA. Drainage was to the Boreal Sea near present-day Alberta and Saskatchewan. They also determined that very little area was draining to the Gulf of Mexico (GOM) during this time.

In contrast, they determined that the Paleocene drainage shifted dramatically from that of the Cretaceous, resulting in much of the USA draining southward to the GOM. As noted on their map, this was not a single river like the modern Mississippi River, but a series of rivers, effectively behaving more like sheet wash, draining into the GOM all at once. This shift in drainage coincides nicely with the end of the Zuni Sequence and the onset of the Tejas Sequence.

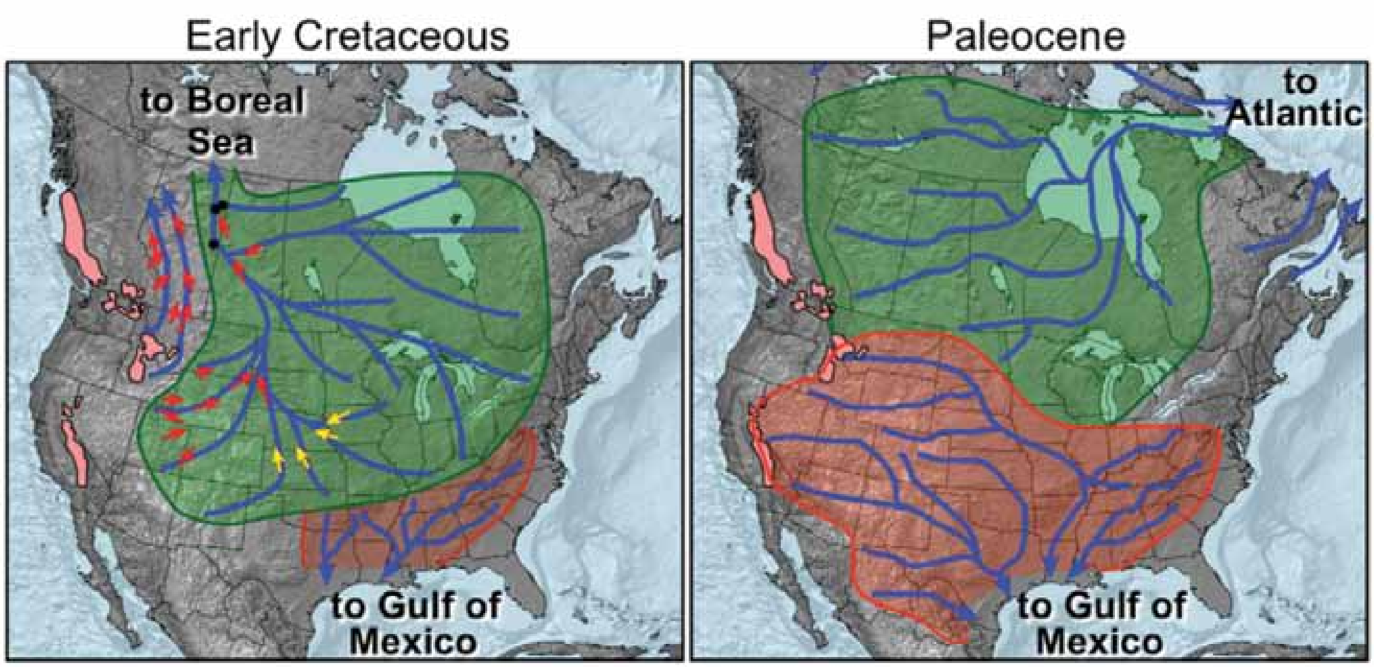


Figure 3. Paleo-drainage maps based on detrital zircon analysis across North America in the Early (Lower) Cretaceous and in the Lower Tertiary (Paleocene). Modified from Blum and Pecha (2014).

Blum and Pecha (2014) believe this change in drainage occurred because of the high flooding levels of the North American continent during the Upper Cretaceous, known as the Cretaceous Interior Seaway. They claim that the withdrawal of the floodwaters during the uppermost Cretaceous and earliest Paleocene caused significant reorganization in the drainage pattern and a reverse in flow toward the GOM.

Clarey and Parkes (2016) interpret the Whopper Sand as a result of this rapid drainage shift at the Zuni/Tejas (K-Pg) boundary, when water suddenly began to drain off the North American continent (Interior Seaway) into the GOM, permanently reversing the earlier direction of flow. This shift is marked by the sudden change in deposition from the uppermost Zuni layer (the Lower Paleocene Midway Shale) to the lowermost Tejas (Paleocene-Eocene Whopper Sand). In a Flood model, this would coincide with the change in water direction described for Day 150+ of the Flood. Initial drainage rates in the Paleocene, coinciding with a sudden drop in sea level at the onset of the Tejas, were likely high volume and highly energetic, providing a possible mechanism to transport the thick Whopper Sand into deep water. Over time, the drainage volume lessened, lowering the energy available for transport, until the present-day pattern developed. We now observe small flows compared to what was likely happening during the initial draining of the vast Cretaceous Interior Seaway at the start of the Tejas.

If this is a post-Flood deposit, what local catastrophe can explain this massive sand unit? Whitmore (2013) has made the assertion that "enormous quantities of sediment should be found resting on the post-Flood unconformity." However, the size and scale of the Whopper Sand is beyond any deposit like it in the world. The erosive power to produce this much sand and to transport it so far would have likely affected most of the contiguous USA, as shown in Figure 3 (Blum and Pecha, 2014), making it nearly impossible for animal and human survival. As described above, the best explanation for the Whopper Sand is at the onset of the receding-water phase of the Flood.

2. The Extent and Volume of Cenozoic Sediment

Holt (1996) and Oard (2016b) have previously pointed out the tremendous amount of Cenozoic (post K-Pg) sediment found globally. This is also confirmed by our research. Holt (1996) showed there is more Cenozoic sediment, by volume, than at any other time interval in Phanerozoic history. Admittedly, he also included the ocean sediments in his totals, but his point is verified by the three continents included in this study. Our totals for the sediments on the continents and on the offshore shelves show the volume

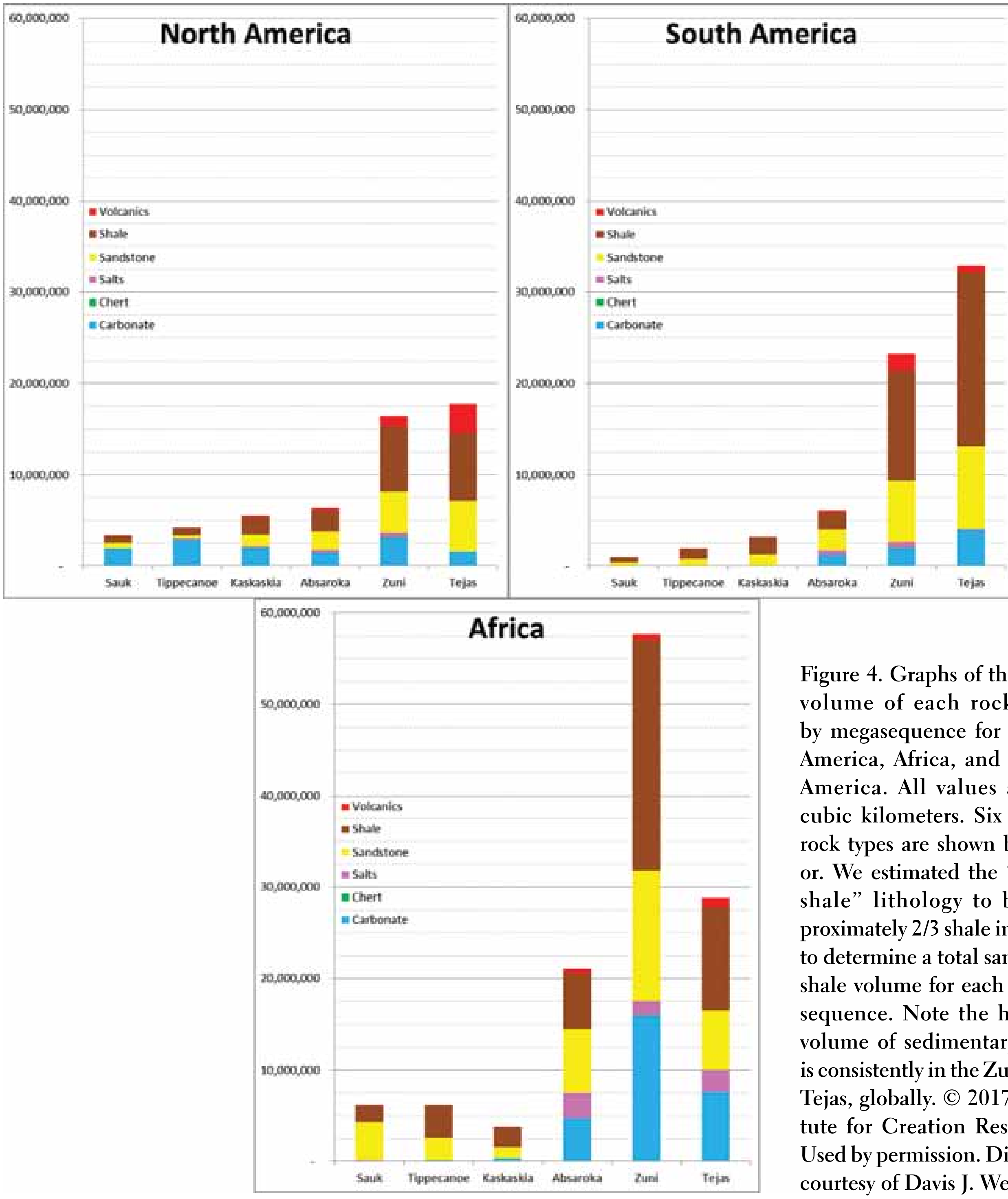


Figure 4. Graphs of the total volume of each rock type by megasequence for North America, Africa, and South America. All values are in cubic kilometers. Six major rock types are shown by color. We estimated the "sand/shale" lithology to be approximately 2/3 shale in order to determine a total sand and shale volume for each megasequence. Note the highest volume of sedimentary rock is consistently in the Zuni and Tejas, globally. © 2017 Institute for Creation Research. Used by permission. Diagram courtesy of Davis J. Werner.

of sediment deposited during the Tejas megasequence to be second only to the Zuni megasequence in terms of global volume (Figure 4).

The advocates of a K-Pg Flood/post-Flood boundary have yet to produce a viable explanation for the vast amount of Cenozoic sediment observed. Although Whitmore (2013) did acknowledge that post-Flood erosion should produce large deposits on the post-Flood boundary, he failed to explain how organisms could have survived while this continental-scale erosion was occurring. The sheer volume of sediment transport would likely have prevented the establishment of any plant and/or animal populations (Figure 4).

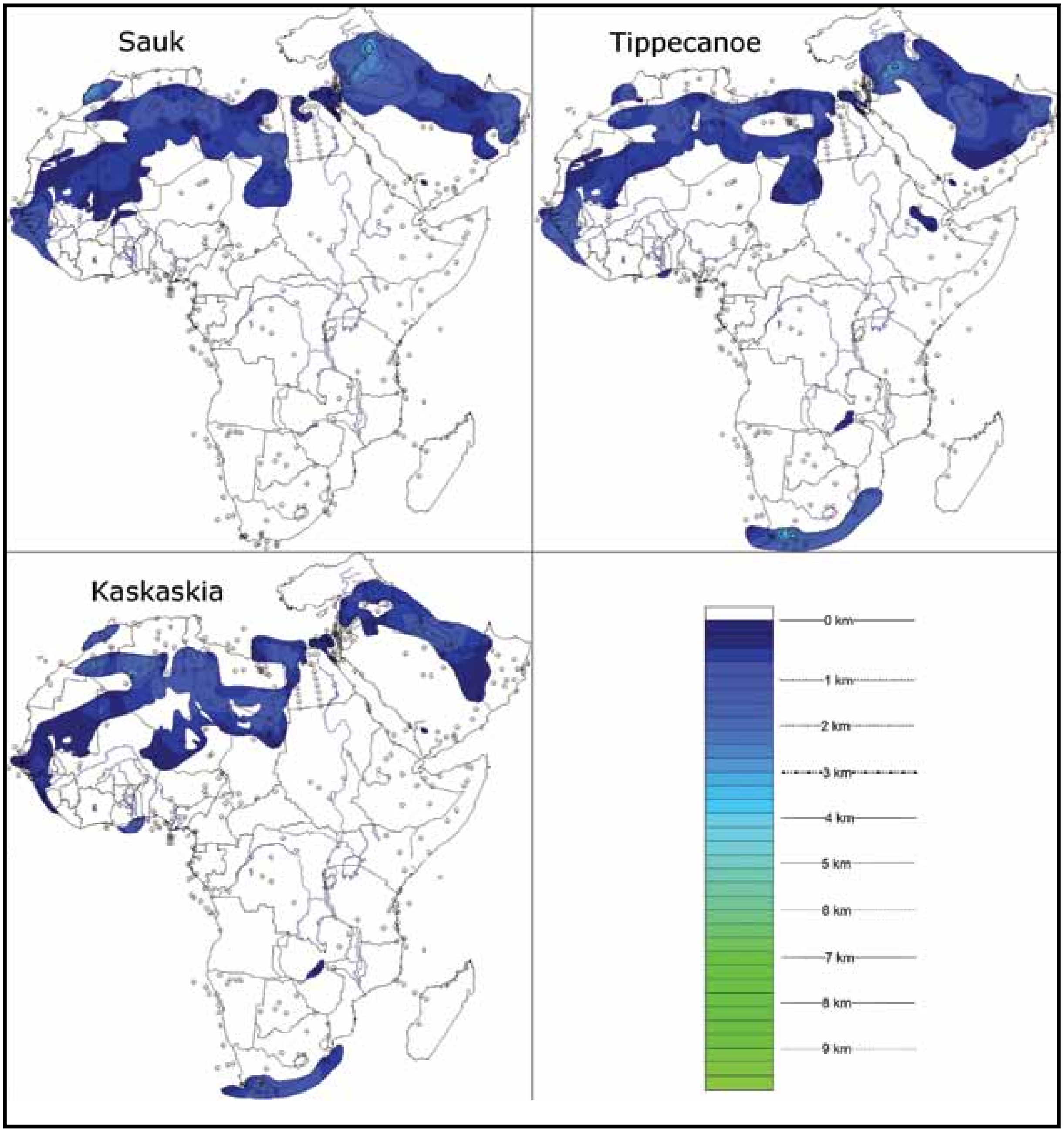


Figure 5. Isopach maps of the Sauk, Tippecanoe, and Kaskaskia megasequences of Africa. Scale is in kilometers. © 2017 Institute for Creation Research. Used by permission. Diagram courtesy of Davis J. Werner.

Another way advocates of a K-Pg Flood/post-Flood boundary have tried to explain the huge volume of Cenozoic (mostly Tejas) sediment is to argue that much of the Cenozoic is the result of erosion of earlier megasequences, thus reducing their relative volumes and increasing the amount of Cenozoic sediment. Snelling (2014a), discussing the paper by Holt (1996), acknowledged that there is a disproportionate amount of Cretaceous (Zuni) and Tertiary (Tejas) sediment preserved in the rock record globally compared to earlier deposits (Sauk through Absaroka, Figure 1). Snelling reasoned that it is impossible to know how much of the earlier megasequences have been eroded and then redeposited as Cretaceous and Tertiary strata. As a consequence, he concluded that the disproportionate amount of later sedimentary strata should not be used as evidence against a K-Pg Flood/post-Flood boundary.

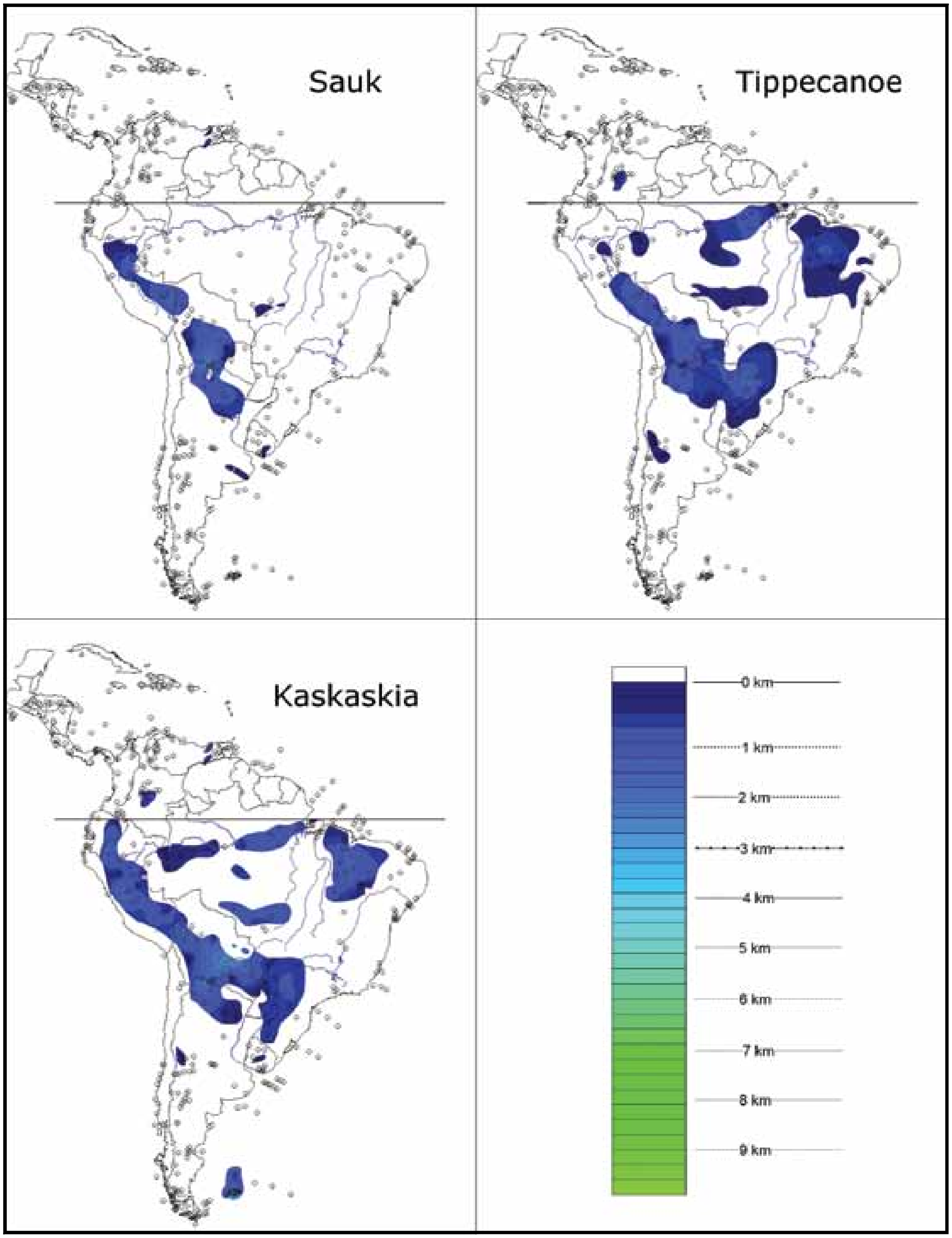


Figure 6. Isopach maps of the Sauk, Tippecanoe, and Kaskaskia megasequences of South America. Scale is in kilometers. © 2017 Institute for Creation Research. Used by permission. Diagram courtesy of Davis J. Werner.

Estimating the exact volume of erosion is difficult to determine if the material is now missing or scattered elsewhere. But if there were lots of earlier erosion that significantly reduced the volume of all pre-Cretaceous strata, there should still be much evidence preserved. Clarey and Werner (2017) have shown that the vast volume of Cenozoic sediment identified by Holt (1996) is also observed across North America, South America, and Africa. All three of

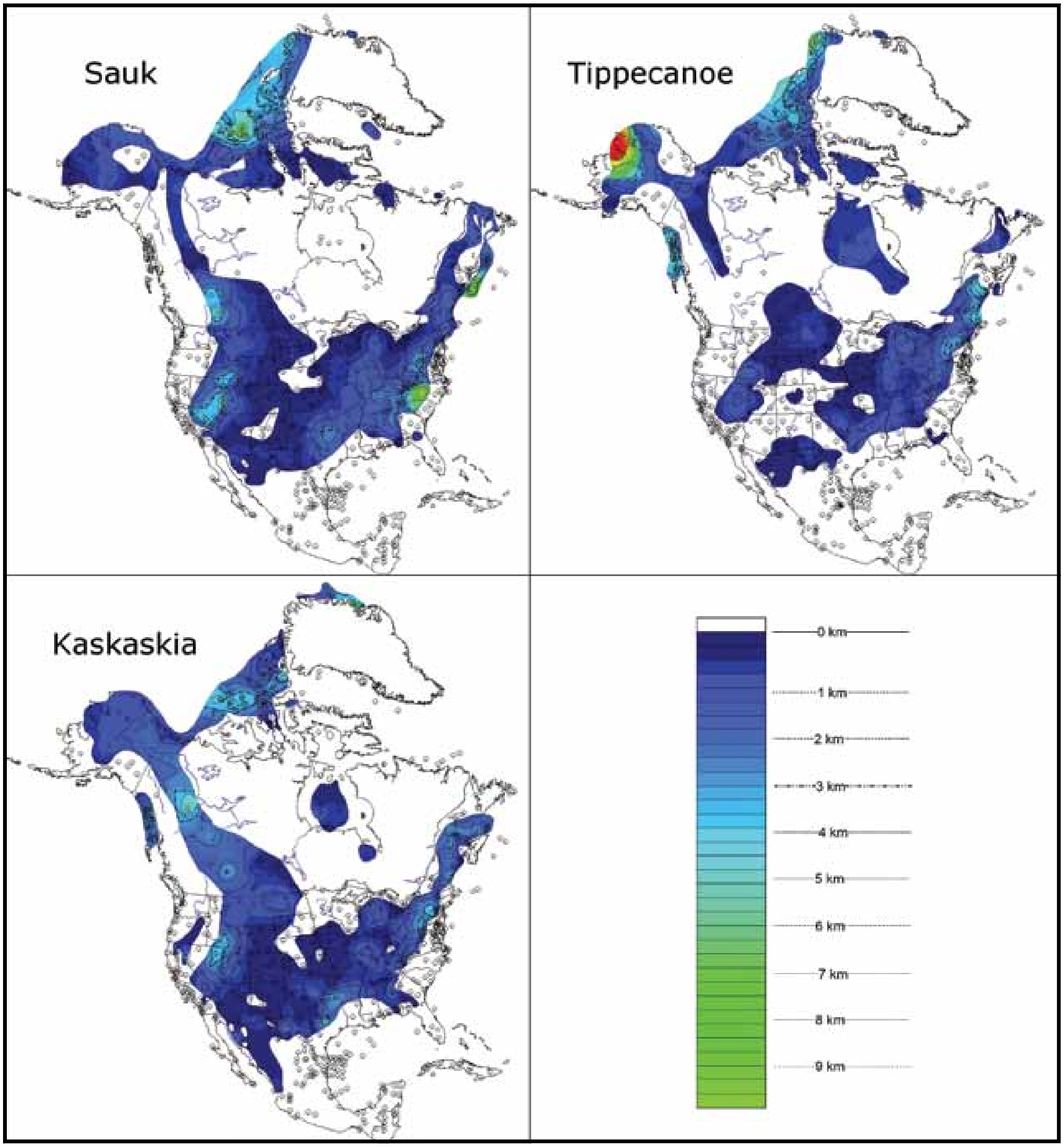
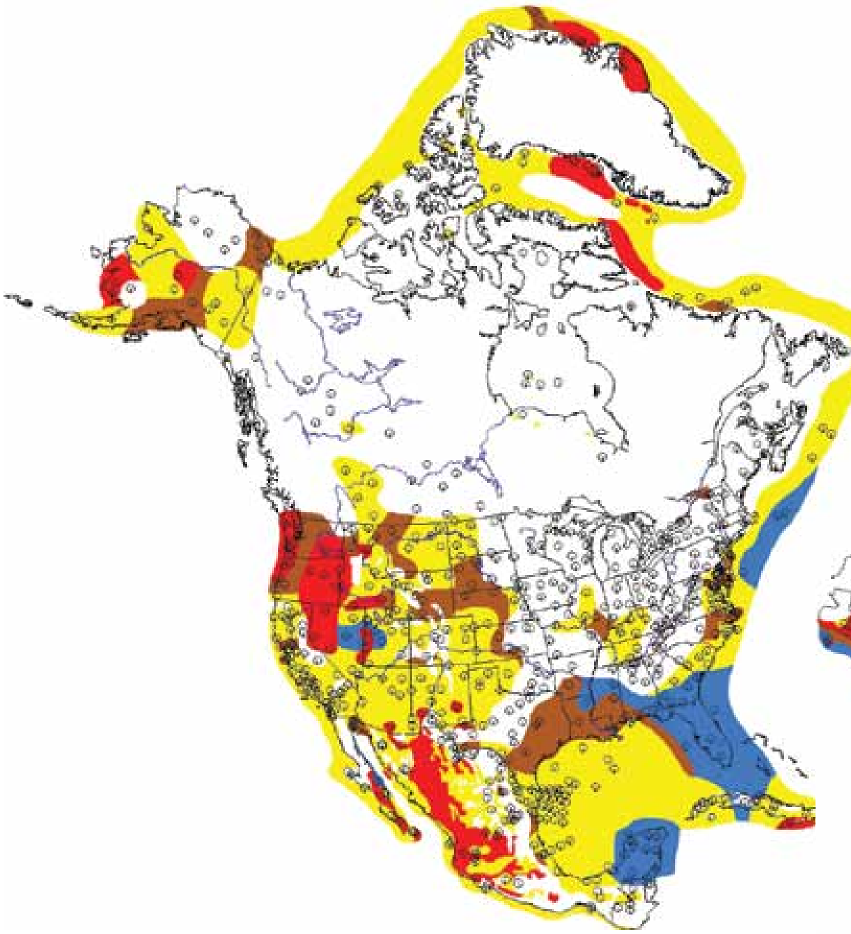


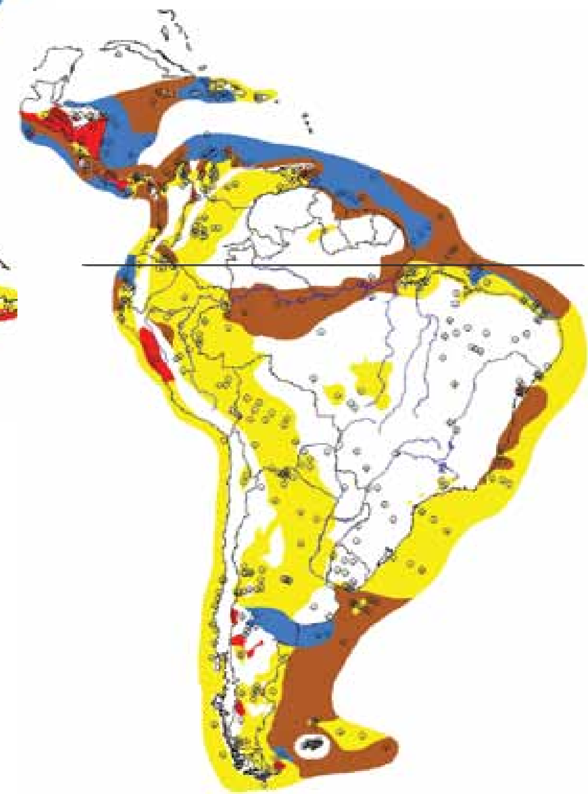
Figure 7. Isopach maps of the Sauk, Tippecanoe, and Kaskaskia megasequences of North America. Scale is in kilometers. © 2017 Institute for Creation Research. Used by permission. Diagram courtesy of Davis J. Werner.

these continents show limited volumes of sediment in the Sauk, Tippecanoe, and Kaskaskia megasequences (Cambrian through Lower Jurassic systems, Fig. 1), and greatly increased amounts of sediment in the latter megasequences (Fig. 4).

Furthermore, Snelling's (2014a) argument that the earlier megasequences were significantly reduced by erosion caused by mountain building near the end of the Flood can be voided by the following observations:

1. There is a consistent internal stratigraphy of each megasequence, where most start out with sandstone followed by shale and then carbonate. For example, the Sauk megasequence still exhibits a complete cycle of basal sandstone (Tapeats equivalent), followed by shale (Bright





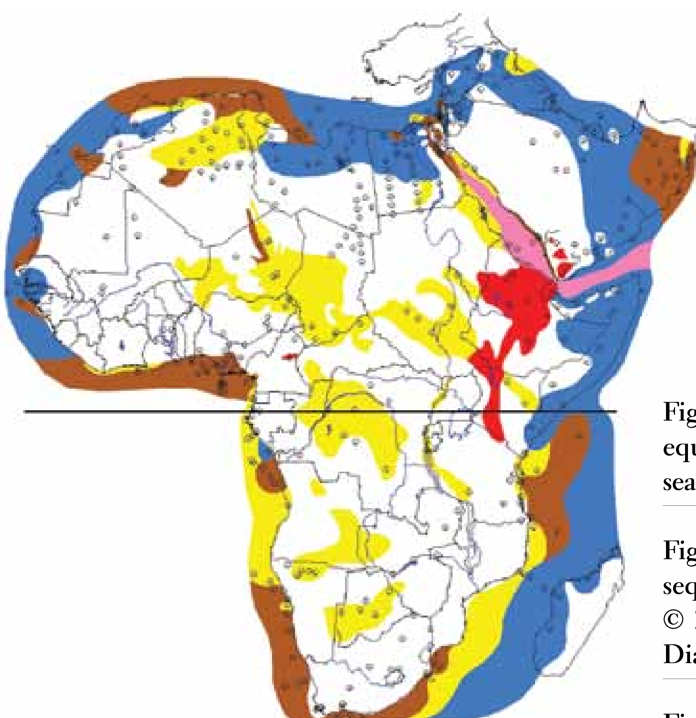


Figure 8 ***(upper left)*****. Basal lithology map for the Tejas megasequence for North America. © 2017 Institute for Creation Research. Used by permission. Diagram courtesy of Davis J. Werner.**

Figure 9 ***(lower left)*****. Basal lithology map for the Tejas megasequence for Africa. © 2017 Institute for Creation Research. © 2017 Institute for Creation Research. Used by permission. Diagram courtesy of Davis J. Werner.**

Figure 10 ***(upper right)*****. Basal lithology map for the Tejas megasequence for South America. © 2017 Institute for Creation Research. Used by permission. Diagram courtesy of Davis J. Werner.**

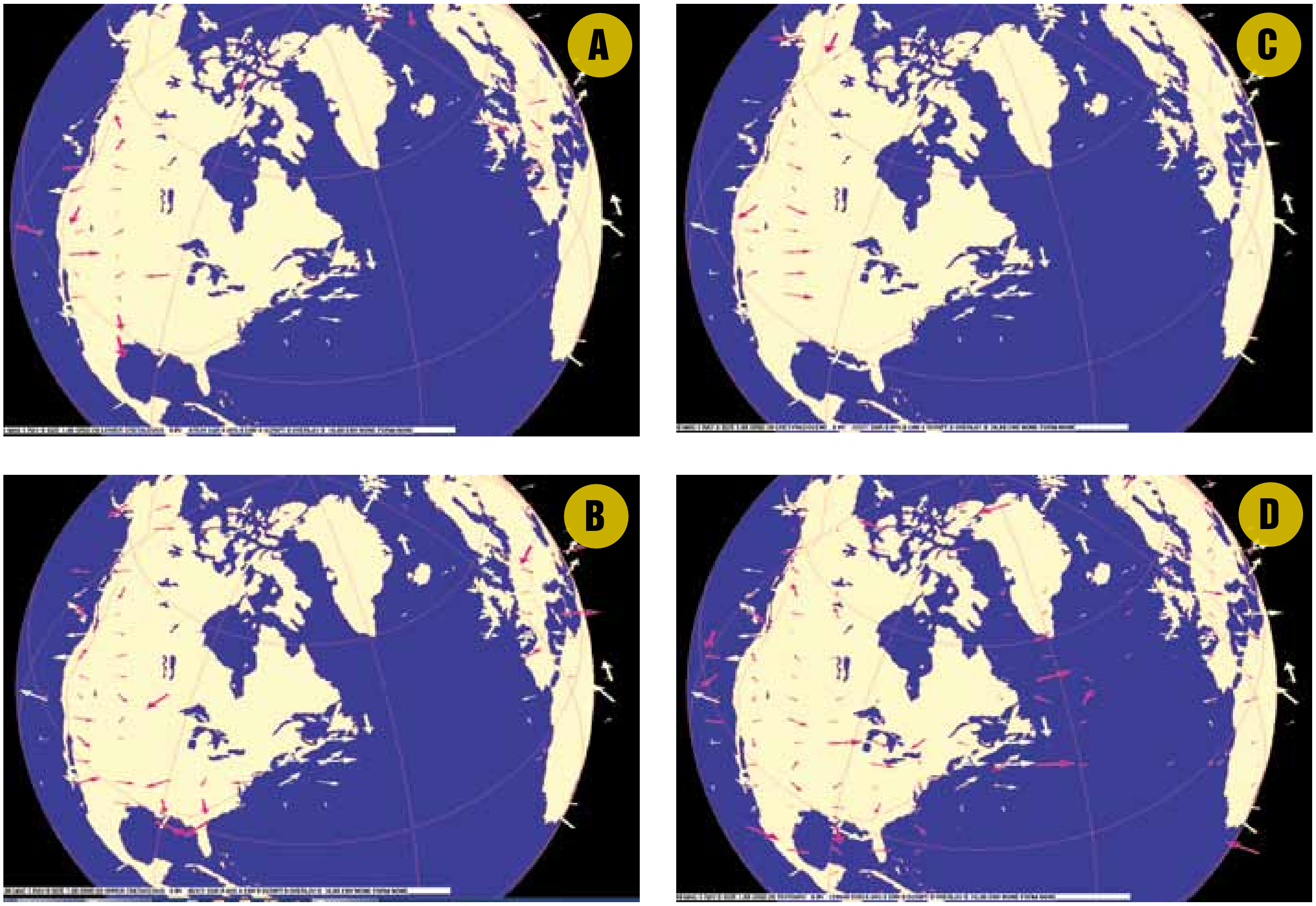


Figure 11. North American current data as mapped by Chadwick (2001). (A) Currents in Lower Cretaceous rocks, (B) Currents in Upper Cretaceous rocks, (C) Currents in Upper Cretaceous-Paleocene (K-Pg boundary) rocks, (D) Currents in Cenozoic rocks. Used by permission of A. Chadwick.

Angel equivalent) and topped by a carbonate (Muav equivalent). This pattern is preserved in most of the earlier megasequences and in the Zuni and Tejas too. Vast erosion, as Snelling (2014a) envisions, would have likely destroyed this systematic signature in many locations, if not totally.

2. There are no reworked fossils and fossil debris in younger Cretaceous and Cenozoic strata. Erosion should have transported vast amounts of fossil material and microfossils from the earlier megasequences and incorporated them into the younger sediments so that no fossil pattern would be discernable in the later megasequences. This is not what is observed. The pattern of sudden appearance, stasis, and sudden disappearance of fossils is prevalent throughout the entire Phanerozoic sedimentological record, Sauk through Tejas (Wise, 2017). Reworking significant amounts of fossils would have obliterated this pattern.
3. There is no significant mountain-building event in Africa like there was in North and South America late in the Flood (Andes and Rockies). And yet, we see the same megasequence pattern of very small volumes of Sauk through Kaskaskia and tremendous amounts of Zuni and Tejas across Africa like we see on the other two continents.
4. The areal extent of the early megasequences matches closely with the pattern of small volumes preserved in the earliest megasequences. This

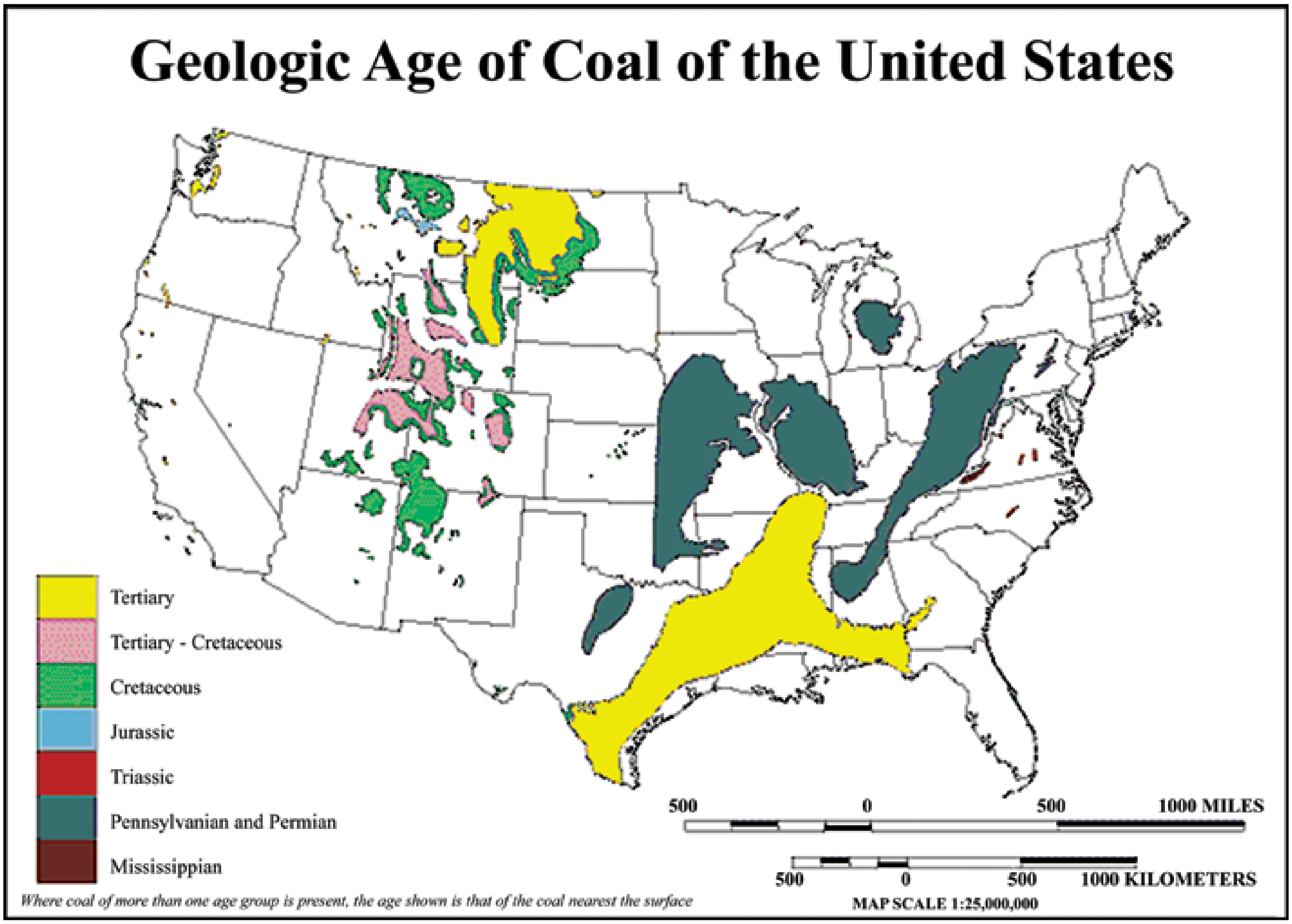


Figure 12. Map of the coal beds in the USA by age. Note the coals in the Western USA are primarily found within Cretaceous and Paleogene rocks. The Pennsylvanian (U. Carboniferous) coals in Eastern USA are thin and discontinuous. The map merely outlines the extent of all coal beds, not individual beds. Modified from USGS map, www.ems.psu.edu/~pisupati/ACSOutreach/Coal2.html, accessed May 15, 2017.

is particularly noticeable in Africa and South America (Figures 5 and 6). If erosion did significantly reduce the volume of earlier sediments, there should still be many small remnants of the Sauk through Kaskaskia scattered across these two continents, and in a random distribution. We do not see this pattern. The early megasequences are confined to the same part of the same continents and stack uniformly one on top of the other. This pattern is particularly consistent across North Africa (Figure 5). And even the more extensive coverage shown by the early megasequences across North America consists of extremely thin deposits across the central USA (Clarey, 2015) (Figure 7).

As Clarey and Werner (2017, p. 279) stated:

> The above patterns observed for each of the first three megasequences are not explainable as mere erosional coincidence. Instead, they are best explained by similar patterns of deposition across the same areas of the same continents. Erosion would not leave this consistent of a megasequence pattern on each of the three continents.

The Tejas megasequence extends from near the base of the Paleogene System to the top of the Neogene (Figure 1). The top of this megasequence coincides with the newly identified sixth great extinction (Pimiento et al., 2017). Cenozoic uplift of the Rocky Moun-

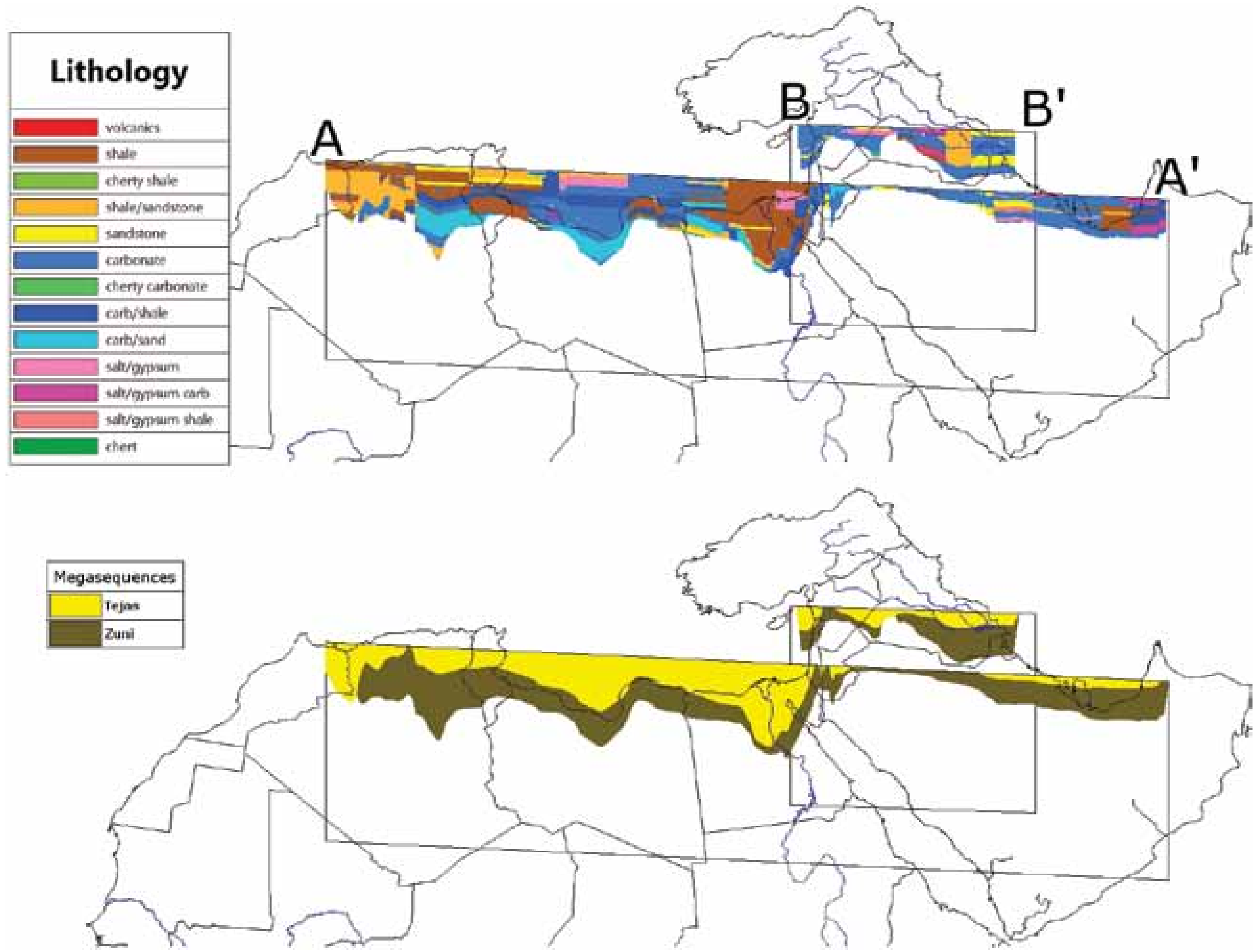


Figure 13. Stratigraphic sections A-A' and B-B' showing the lithology (upper) and the megasequences (lower) across North Africa and the Middle East. Note the carbonate rocks (in blue) in the Zuni megasequence extend upward continually to the top of the Tejas in many locations on the section. The uppermost Tejas in this area is primarily Miocene and commonly contains salt (in pink) deposits associated with the Mediterranean region. © 2017 Institute for Creation Research. Used by permission. Diagram courtesy of Davis J. Werner.

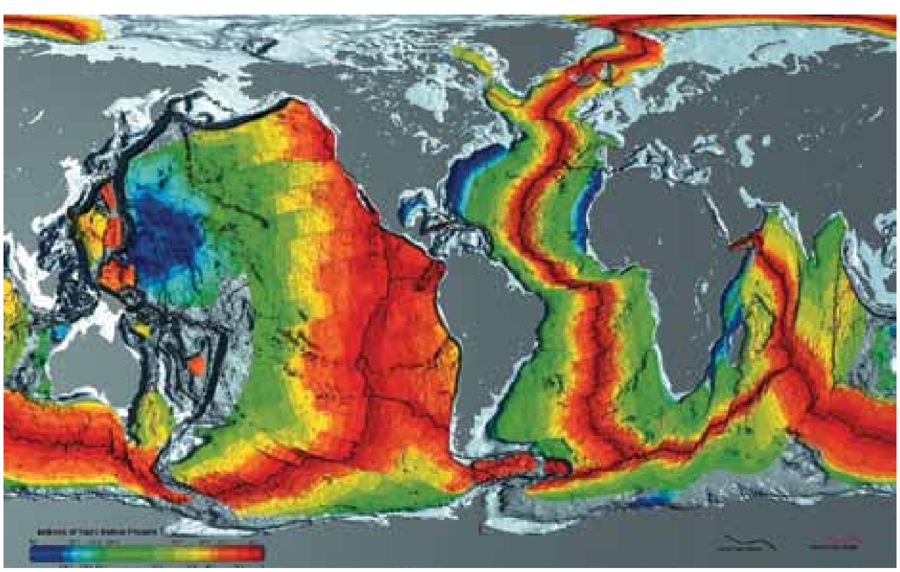


Figure 14. Map showing the age of the ocean crust from «Earth seafloor crust age 1996 - 2». The Cenozoic seafloor is shown in yellow, orange and red. Note how much of the ocean crust formed during the Cenozoic. The presumed secular ages are shown in the scale on the bottom left. Licensed under Public Domain via Wikimedia Commons (https://commons.wikimedia.org/wiki/File:Earth_seafloor_crust_age_1996_-_2.png#/media/File:Earth_seafloor_crust_age_1996_-_2.png. Accessed Aug. 5, 2015).

tains shed millions of cubic kilometers of clay and sand across the Western States. Many of the basins in between the uplifted Rocky Mountains are filled with over 3000 m of Tejas sediment. The Bighorn Basin has 3500 m, the Wind River Basin has 2875 m, the Washakie Basin has 3600 m, the Shirley Basin 3500 m, and the Green River Basin has 3000 m of Tejas sediment to name a few. This volume of sediment, laid down in a 100-year time frame (about 30 m/year), is nearly unimaginable if humans and animals were living in these areas post-Flood.

A notable shift in drainage near the base of the Tejas (Blum and Pecha, 2014) across North America poured tremendous amounts of siliciclastics into the Gulf of Mexico (GOM), including the basal Tejas Whopper Sand (discussed above), which covers the deep, central GOM with a blanket of sand exceeding 300 m in thickness (Clarey and Werner, 2018) (Figure 2). Siliciclastic deposition continued to spread across the continental shelf along much of the Atlantic seaboard, offshore northern Canada, and Greenland. Few deposits were preserved in the eastern USA and across Canada, other than offshore (Figure 8).

The basal Tejas in Africa again shows a fairly extensive sandstone deposit across the center of the continent (Figure 9). Simultaneously, a blanket of continuous carbonate deposition still dominated North Africa and offshore East Africa during the early Tejas. Figure 9 shows the carbonate deposition across major portions of North Africa never ceased throughout the entire Zuni and through much of the entire record of the Tejas. This continuous deposition of carbonate rock continued all the way up from the Cretaceous system to the top or middle of the Miocene in many countries like Libya, Iraq, Iran, southeast Turkey, Qatar and Oman (Figure 9 and Kendall et al., 2014). A more thorough discussion on this is below.

Interestingly, the stratigraphic columns in the Red Sea record upwards of 3000 m of continual salt deposition starting at the base of the Tejas (Figure 9). Oil geologists from Aramco claim there are areas with even thicker salt (up to 5000 m) in the Red Sea (personal communication, 2016). This extensive salt deposit also documented the split of the Saudi Arabian Peninsula from the Horn of Africa during the Tejas megasequence. This splitting would likely have caused tremendous earthquakes to have occurred in the Middle East region at that time. These earthquakes would have wreaked havoc on anyone living in the region at the time, if this was indeed, after the Flood.

The basal Tejas megasequence across South America shows an extensive sandstone layer running the length of the continent and east of the Andes Mountains (Figure 10). It is likely this deposit was from sediment eroded off the uplifting mountains and shed eastward, similar to the deposits in the basal Tejas east of the Rocky Mountains in North America at the same time. Extensive sandstones are also found along large segments of the offshore shelf regions of South America. Areas of extensive shale and/or carbonate deposition also dominated the basal Tejas in the Amazon Basin and along the northeast and extreme southeast parts of the offshore, including the Caribbean.

Using the paper by Snelling and Matthews (2013), Clarey (2016a) has calculated that the time between the end of the Flood and the onset of the Ice Age was about 100 years. Advocates for a K-Pg end of the Flood must assume all Paleogene and Neogene (Tejas) deposition occurred in this time frame. For this reason, Wise (2017) has proposed evolutionary saltation to explain the mammal fossil record in the Cenozoic. Essentially, Wise is suggesting evolutionary changes at the species level and above, from one generation to the next. Surprisingly, this is more rapid evolution that that being proposed by most secular scientists. Wise (2009, p. 143) has even proposed whales may have evolved after the Flood, and that "vestigial legs and hips in modern whales confirm legged ancestors of the whales existed only a short time ago."

Wise (2009, p. 144) has concluded that "mammal taxa which lack a fossil record from the Lower Eocene or before can be understood to have arisen after the Flood as subtaxa of ark kinds." Wise (2009, p. 136) has also pointed out that "44% of living mammal genera have no fossil record at all." However, just because the fossils of living mammals do not appear until later in the Cenozoic does not prove they "evolved" after the Flood. Alternatively, this same mammalian pattern could be explained by ecological zonation, where many of the living mammal genera may have been living at the highest pre-Flood elevations and therefore were buried later. The Bible states that the Flood waters prevailed 15 cubits upward of the highest hills (Gen. 7:20) and buried the cattle also, along with everything that creeped upon the earth, including mankind (Gen. 7:21–23). Fifteen cubits (about 22–30 feet) likely did not provide sufficient depth for sediment to accumulate and make fossils on the highest elevations. The result would be a bleak to nonexistent fossil record, similar to that of humans. This may help explain why so many living mammal genera are nonexistent in the fossil record and/or appear later in the Cenozoic only.

Furthermore, advocates for a K-Pg Flood/post-Flood boundary have claimed the areal distribution of sedimentary rocks shifts from a more continental scale to a more regional scale at the end of the Cretaceous (Austin et al., 1994). And they have argued that water current directions, recorded in ripple directions, support this shift in pattern, going from large-scale continental flow to scattered, local-scale flow (Wise, 2009). However, the claim of a more localized distribution of the sedimentary rocks above the K-Pg (Tejas) primarily applies to the American West (Figure 8), where disruptions in flow in and around the Rocky Mountains are to be expected, and is not observable on other continents like Africa and South America (Figures 9 and 10).

Likewise, the claimed discontinuous nature of the current data above the K-Pg boundary also primarily applies to western North America where the Rocky Mountains were being actively uplifted in the early Cenozoic. The Rocky Mountains are also unusual in their wide swath across the North American continent. Other continents, like Africa and South America have narrower (Andes Mountains) and/or more limited post-Cretaceous uplifts.

Finally, and in contrast to the claim of Wise (2009, p. 130), an examination of Art Chadwick's (2001) current data does not show a clear shift in pattern "from consistent basin-ignoring transcontinental direction to scattered, basin-centering directions" below and above the K-Pg boundary, respectively. Figure 11 shows the current data across North America from the Lower Cretaceous through the Cenozoic as provided by Chadwick (2001). These data show a fairly scattered, nonuniform pattern existed from the Lower Cretaceous right on through the Cenozoic. Indeed, Chadwick (2001) himself noted that the trends in Paleocene rocks were consistent with the trends in the Upper Cretaceous rocks. The change from a more transcontinental flow pattern across North America to a more scattered pattern occurs much earlier in the Flood record, closer to the Mesozoic/Paleozoic boundary (Chadwick, 2001). However, as noted above (Figure 3), there does appear to be some evidence of a major shift in drainage direction across the USA near the base of the Tejas megasequence.

The tremendous amount of Cenozoic sediment cannot be easily dismissed as the product of local catastrophes as previously suggested. There is too much volume globally, and the time frame of 100 years precludes a post-Flood explanation. These sediments, and the fossils they contain, are better explained by the receding-water phase of the Flood. Maintaining they are post-Flood as some creationists claim, and deposited by some as-of-yet poorly described and unknown types of catastrophes, leads to evolutionary hypotheses beyond that of most secularist scientists.

3. The Extent and Thickness of Cenozoic Coal Seams

Cenozoic coal beds are some of the most neglected strata in the creation literature. Only Holt (1996), Oard (2017a), and Clarey (2017) seem to have published on their extent and significance. Previously, Wise (2002, p. 202) claimed:

> Most of the world's coals are made of the large trees of the antediluvian floating forest [lycopod trees] described in Chapter 12 [of his book]. This provided the sheer mass of plant material necessary to produce most of the earth's coals.

However, this is not accurate today. As discussed below, most of the world's coal is found concentrated in Tertiary (Cenozoic) strata and are not composed of lycopod trees (Clarey, 2017).

Most Flood geologists are in favor of an allochthonous origin for coal, resulting from transport of vegetation by the high energy of the Flood. Creation scientists point to the tree mat that formed on Spirit Lake from the eruption of Mt. St. Helens in 1980 as verification of this process. Allochthonous coal is not the issue that is being criticized by Clarey (2015, 2017) and Clarey and Tomkins (2016). These papers only question the viability of a pre-Flood floating forest biome and the presumption that this environment covered much of the pre-Flood ocean surface. As these papers demonstrated, there are serious geological problems with the floating forest hypothesis. Clarey and Tomkins (2016, p. 120) concluded:

> All available geologic and fossilized anatomical data support the existence of pre-Flood lycopod forests rooted in soil. These forests were likely located in wetlands and/or coastal lowland areas as suggested by Clarey (2015). Detailed analysis further demonstrates the trunks and the roots were not hollow as previously claimed. Based on these data, and that of Clarey (2015), we strongly recommend abandoning the floating forest model.

Furthermore, lycopod-rich coal beds are confined primarily to Upper Carboniferous rock layers (Clarey, 2015). Coal deposits found in later Flood rocks show steadily decreasing numbers of lycopod trees and more and more conifers and many angiosperms. In fact, the thickest and most extensive coals in the USA are from Cretaceous and Paleogene rock layers and are almost exclusively composed of conifer-dominant plants, like the metasequoia, and very few, if any, lycopods (Carroll, 2017b).

Most of the coals in the USA Great Plains states are found within Cretaceous and/or Paleogene strata and contain virtually zero lycopod tree remnants (Figure 12) (Tully, 1996). In contrast, the coal beds in the eastern USA, which are composed primarily of lycopod trees, are found almost exclusively within Carboniferous rock layers (Fig. 12). These include the Pennsylvanian (Upper Carboniferous) coals in Illinois, Michigan, and the Appalachian region. The Carboniferous coal beds in the eastern USA are usually 3.0 m or less in thickness. Whereas, the non-lycopod-rich coal beds in the Colorado Plateau and Northern Rockies usually exceed 3.0 m, especially in the Powder River Basin of Wyoming, where beds are often thicker than 15 m over significant areal distances (Luppens et al., 2009).

Indeed, the Powder River Basin (PRB) coals, which are all within Paleogene system rock layers, contain the largest reserves of low-sulfur subbituminous coal in the world (Luppens et al., 2013). Approximately 42% of the present coal production in the USA comes from the Powder River Basin (Luppens et al., 2013). At least six or more coal beds in the PRB exceed 30 m in thickness and some individual beds have been shown to extend for over 120 km (Luppens et al., 2013). Some of these coal beds can exceed 70 m thick in places, such as the Big George coal layer (Scott et al., 2010). The United States Geological Survey (USGS) has estimated that the total in-place coal resources of the PRB is approximately 971 billion metric tons, with just ten individual beds making up about 80% of that value (Luppens et al., 2013). The vast majority of the PRB coals are found in Cenozoic rocks such as the Tongue River Member of the Paleocene Fort Union Formation (Luppens et al., 2013).

It is quite clear that the Cenozoic coal seams in the PRB were not deposited by post-Flood river systems as they are not even remotely sinuous or river-shaped. Using nearly 30,000 drill holes, Luppens et al. (2013) mapped 13 separate coal seams, stacked one on top of the other, through the center of the PRB. They found that several of the seams extended over 100 km north-south and also 100 km east-west. No known river systems and/or local landslides could deposit vegetation (coal) of this extent and thickness, over and over, giving the stacked coal seams found in the PRB today.

The massive Cenozoic coal beds are not exclusive to the USA. Cenozoic coal beds in South America (SA) are also the thickest and most areally extensive across that continent too (Weaver and Wood, 1994). It is estimated that the Cenozoic coal beds make up about one-half of all coal in SA, and the tonnage is estimated to be greater than any other geologic system or combination of systems (Weaver and Wood, 1994). And interestingly, Germany, one of the largest lignite coal producers in Europe, has approximately 65% of its reserves in Cenozoic rocks (Sheldon, 2005). The Rhenish Basin in Germany has lignite coal seams up to 90 m thick within Cenozoic (Tertiary) sediments (Thomas, 2002).

How can coals as extensive and thick as noted above be deposited in a post-Flood scenario? What local catastrophe could deposit continuous coal seams exceeding 100 km in extent and upwards of 50 m thick and lignite beds up to 90 m thick? And it is not just one layer, but multiple layers. Coal deposits this large are unexplainable within the uniformitarian worldview (Snelling, 2009) and equally unexplainable within the creationist worldview if they are deemed post-Flood. Only a global Flood event could produce these coal seams.

How did these massive coal seams form? Evidence for the allochthonous origin of coal is abundant (Snelling, 2009), even down to the sharp contacts of the coal beds with the sediments above and below. There is no evidence of rooting extending downward below the coal bed base into the substrate below, as would be expected if buried in place as uniformitarian scientists contend. Instead, it is likely that the receding water of the Flood transported massive, floating vegetation mats that were torn loose from the pre-Flood land surfaces. For the Powder River Basin coals, these vegetation mats likely became trapped up against the rapidly rising uplifts like the Bighorn Mountains and subsequently buried repeatedly in a succession of waves. Thus, a global Flood scenario better explains the extent and repetitive nature of these thick coal seams.

4. The Continuum of Cretaceous and Cenozoic Carbonates Across North Africa and the Middle East

The lowermost unit in the Tejas megasequence in Africa again shows a fairly extensive sandstone deposit across the center of the continent (Figure 9). Simultaneously, a blanket of continuous marine carbonate deposition dominated North Africa, the Middle East, and offshore East Africa. Figure 13 shows carbonate deposition across major portions of North Africa never ceased throughout the entire Zuni megasequence and throughout most of the entire record of the Tejas. This continuous deposition of carbonate rock continued all the way up from the Cretaceous system to the top or middle of the Miocene in many countries like Libya, Iraq, Iran, southeast Turkey, Qatar and Oman (Figure 13 and Kendall et al., 2014).

One of the arguments made by Whitmore (2006) and Snelling (2009) is the claim that the K-Pg boundary marks a shift in sedimentation pattern and environment. They have claimed that Mesozoic strata are dominantly marine deposits while the Cenozoic strata are dominantly continental deposits. However, this argument seems to be based solely on the American West, where Cenozoic sediments in great amounts were shed locally as the Rocky Mountains were rapidly uplifted in the Early Cenozoic (Paleogene). However, it also ignores the presence of marine fossils in deposits like the Green River Formation, such as herring and rays (Clarey, 2016b). Second, this view too readily accepts the secular depositional interpretations for the Cenozoic deposits in North America, even to the point of accepting that fossil herring were freshwater herring in the past.

Globally, however, there is little evidence of a sudden shift from marine to continental at the K-Pg boundary. The aforementioned African megasequence data illustrate this point. Indeed, there is no change in sedimentation at the K-Pg across North Africa or the Middle East, including Iraq. The geology simply shows continuous marine carbonate deposition from the Cretaceous, uninterrupted, all the way through the Miocene.

Furthermore, Vandenberghe et

al. (2014) noted that there was still considerable marine influence across northern Europe through the Miocene (with ample glauconitic sands) and even into the lowermost Pliocene. And it is not until the Pliocene that the marine sedimentation pattern is broken in the Lower Rhine Valley.

Of all the countries in this study however, perhaps Iraq is of most interest. This is where the Bible tells us the Tower of Babel was most likely located. This is where the Tigris and Euphrates Rivers flow. This is where civilization initially settled after Noah and his family came out of the ark. And yet, this country shows continuous deposition of carbonate sediment, up to several kilometers thick across much of the nation (Figure 13). These carbonate rocks begin in the Cretaceous and continue, uninterrupted, all the way through the Middle Miocene (Grabowski, 2014).

There are several oil fields in the valley of the Tigris and Euphrates Rivers, or along their source areas north of Baghdad, that produce from Miocene carbonates and are sealed by Miocene salt/gypsum layers, like Ajil, Chia Surka, and Jambur (Grabowski, 2014). How can the Tower of Babel be built in an area still dominated by widespread carbonate and salt/gypsum deposition? These are marine deposits that only form under seawater! And these deposits are not trivial but up to thousands of meters thick! The geology of Iraq is the closest thing to "proof" that the Flood was not over in the North Africa and Middle East region until at least the post-Miocene.

5. The Tremendous Volume of Cenozoic-age Ocean Crust

Finally, the process of seafloor spreading did not, in any way, cease at the end of the Cretaceous. There is no evidence of a change in seafloor spreading rate that coincides with the K-Pg boundary. In fact, the rocks support just the opposite scenario. Indeed, the runaway subduction described by Baumgardner (1994) caused the creation of approximately one-third to one-half of the world's ocean crust to form in the Cenozoic, and in particular, during the deposition of the Tejas megasequence (Paleocene through Pliocene). Figure 14 shows the age of the ocean crust, based on secular age dates. However, these dates also are verified by the sedimentary strata, at least in a relative sense. Although we do not advocate millions of years, we do recognize the consistent sedimentological pattern of deposition that shows the youngest sediments deposited nearest the ridges and the progressively older sediment found farther from the ridges. This sedimentary pattern verifies the relative ages of the ocean crust beneath, finding the youngest crust at the ridges and the oldest crust farthest away in both directions (Hess, 1962).

Those who advocate the K-Pg as the Flood/post-Flood boundary must explain how the plates could still be moving at rates of kilometers per hour (Baumgardner, 1994) while claiming the Flood was over. Snelling (2014b) has used the onset of catastrophic plate tectonics (CPT) to start the Floodwater's encroachment onto the land in a series of tsunami-like waves, but he has failed to explain how the Flood could be over while the plates were still moving as rapidly as the seafloor geology indicates. The earthquakes associated with this continued plate motion would have continued to send tsunami waves crashing across the continents. Baumgardner (2016) has modeled the height of tsunami waves generated by rapid plate motion and suggests they could have exceeded hundreds of meters on the continents. In addition, the huge earthquakes would have been devastating for any type of human civilization after the Flood, if the Flood/post-Flood boundary is located at the K-Pg.

Furthermore, to create the new seafloor, the old, original Creation Week seafloor was presumably consumed by subduction. It was this density contrast, of the cold, old original oceanic lithosphere, that allowed the runaway subduction process to begin and continue. This density difference served essentially as the "fuel." Baumgardner (2016, p. 16) describes it as "gravitational energy driving the motion" of the plates. Indeed, this "runaway" process would continue to run its course until all the original oceanic lithosphere was consumed. There was no geophysical means or reason to stop the rapid plate motion until the density contrast was fully alleviated. At that moment, the lithosphere would cease the runaway subduction process, slowing dramatically and also slowing down the production of new lithosphere at the ridges. As a consequence, we witness only small, residual plate motion of cm/yr today. This "slowing" was likely about the time of deposition of the Pliocene rocks, based on the age of the ocean floor (Figure 14). This "slowing" also coincides with the first of the major Hawaiian Islands (Kauai) appearing above the surface.

Others have tried to claim that seafloor spreading had slowed sufficiently during the onset of the Tejas, even using the Hawaiian Islands as evidence (Whitmore, 2013). But all of the Hawaiian Islands are Pliocene and younger. Even the advocates of a Pliocene Flood/post-Flood boundary would agree the plates were slowing at that point.

Further Discussion

The purpose of this paper is not to analyze all the criteria proposed by Whitmore and Garner (2008) for identifying pre-Flood, Flood, and post-Flood boundaries. However, this paper has addressed three of the criteria they deemed were of highest importance; namely (1) marine deposits on the continents, (2) deposits of unparalleled extent, and (3) global and regional unconformities. Whitmore and Garner (2008) applied these and other criteria to a single location in the Rocky Mountains of western Wyoming, concluding that the post-Flood began somewhere near the top of the Cretaceous section (Lance Formation).

Unlike Whitmore and Garner (2008), who applied these criteria only to western Wyoming, the present study has examined the rock record across three entire continental masses, furthermore recognizing marine vs. continental deposits is sometimes ambiguous and arbitrary. Rock formations like the Coconino Sandstone are thought to be continental deposits by most secular geologists and yet contain ample evidence of marine deposition (Whitmore et al., 2014). Regardless, it seems likely that Cenozoic uplifts like the Rocky Mountains and the Andes Mountains rose rapidly above the receding Floodwaters before most of the continents had fully drained. Therefore, it should be expected that the mountainous regions would appear to be more heavily influenced by continental-looking deposits. In this regard, the conclusion of Whitmore and Garner (2008) for western Wyoming does appear to be correct. However, when examining this criterion on a global scale, extensive deposits of marine sediments are observed across northern Europe (Vandenberghe et al. 2014), North Africa, and the Middle East (Figure 13). We conclude that marine deposition continued across large expanses of the continents well above the K-Pg boundary and continued to the top of the Miocene or higher.

Whitmore and Garner (2008) have further asserted, as have Austin et al. (1994), that deposits of unparalleled extent cease near the top of the K-Pg boundary and that Cenozoic deposits are more "localized" in extent. However, this interpretation also seems influenced by primarily studying rocks within the Rocky Mountain region. It seems obvious that the numerous uplifts and adjacent basins within mountainous regions would tend to localize deposition on a basin-by-basin basis as the uplifts blocked and divided the depositional pathways. However, when viewing the sedimentological data on a global scale, as in this paper, a completely different picture is revealed, as described above. Figures 8, 9, and 10 show extensive deposits of Tejas (Cenozoic) strata spread across great expanses of the continents, including the continental shelves. And the volume of Tejas sediment globally is second only to the Zuni megasequence (Clarey and Werner, 2017). Applying the criterion of "deposits of unparalleled extent" leads to a post-Flood boundary interpretation that is much higher than the K-Pg.

Finally, this paper also touched on the "global and regional unconformities" criterion. Whitmore and Garner (2008) have stated that they expected widespread erosional surfaces to mark the end of the Flood's recession off the continents. At the time of their publication, a global stratigraphic discontinuity had yet to be identified above the K-Pg boundary. However, a major "biostratigraphic break" has recently been located near the top of the Pliocene. Pimiento et al. (2017) determined that 36% of the Pliocene genera failed to cross the Pliocene/Pleistocene boundary. Furthermore, they calculated extinction rates to be three times higher in the Late Pliocene relative to the rest of the Cenozoic (Pimiento et al., 2017). Although many creation scientists do not accept that these represent true extinction events, they do acknowledge that these extinctions mark the last appearance of these particular fossils in the rock record. Therefore, there appears to be fossil evidence of a global "break," or disconformity, at or near the top of the Pliocene. This so-called sixth extinction may coincide with the end of the receding-phase of the Flood.

Conclusions

This paper presents empirical evidence that challenges many of the arguments for a Flood/post-Flood boundary at the top of the Cretaceous. Indeed, these data establish that the Flood/post-Flood boundary had to have been much higher in the Cenozoic rock record. Five major arguments are put forth challenging the K-Pg boundary as the Flood/post-Flood boundary and against any explanation involving local catastrophes to explain the Cenozoic record: (1) the presence of the Whopper Sand in the Gulf of Mexico; (2) the tremendous amount of Tejas sediment deposited globally; (3) the fact that the thickest and most extensive coal seams are found globally in Tejas sediments; (4) the identification of uninterrupted carbonate deposition across the K-Pg boundary and continuing upward through Miocene strata across the whole of North Africa and the Middle East, areas just to the south of the landing site for the ark in Turkey. The geology of Iraq, in itself, suggests it is nearly impossible to try to pick a Flood/post-Flood boundary any lower than the Miocene. A final challenge (5) is the tremendous amount of rapid ocean crust/seafloor spreading that continued right across the K-Pg boundary and up to the Pliocene, with no indication of a significant change in velocity. Collectively, these data suggest that much of the Cenozoic was likely the receding phase of the great Flood.

In addition, the advocates for a K-Pg boundary end to the Flood have backed themselves into a corner by giving themselves only about 100 years of time for the entire Tertiary system to be deposited in a series of local catastrophes (Snelling and Matthews, 2013; Clarey, 2016a). This is why Wise (2017) is advocating evolutionary saltation to explain the mammal record in the Tertiary. He has to. How else do you explain the mammalian fossil record of the Tertiary? And it is extremely unlikely that large mammals could bear sufficient generations of offspring in the time allotted (about 100 years). Many of these mammals take upwards of 10–20 years to reach sexual maturity (around 15 years for Indian elephants) (Plowee, 1943). "Doing the math" makes the claims of mammal evolution in the Cenozoic even more absurd if they are all post-Flood animals.

The results of this paper also call into question much of the claimed paleontological evidence for a K-Pg Flood /post-Flood boundary. Have these studies been too local? Have they been too focused on just one continent? Paleontological data is ambiguous by nature due to inherent biases. It is doubtful the fossil record is truly representative of the number and diversity of organisms in any given community. So much has happened between life, Flood transport and the burial and preservation of the fossils. It's what we don't find, or what hasn't been preserved that we can never recover. Most everyone accepts there are biases to the fossil record. Even Ross's (2012) study of mammals across North America is explainable by simple probability bias (Clarey, 2016a). We need to expand our studies to more global patterns.

And rather ironically, the advocates for a K-Pg boundary have never adequately addressed the question posed by Clarey (2016a) about post-Flood dispersal of the large mammals to the separated continents. How do you move large animals across vast open seas without Ice Age land bridges?

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Ophiolite Conundrums

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Abstract

Ophiolites are a significant puzzle to both uniformitarian and Flood geologists. Currently thought to represent sections of lower crust and upper mantle thrust onto the continents during subduction by a process known as "obduction," ophiolites are found around the planet. Uncertainties in uniformitarian explanations are multiplied by the distinct parameters of biblical history, and no Flood model has yet provided a comprehensive explanation.

Introduction

Ophiolites are fascinating, mysterious rocks. They are thought to be slices of oceanic crust and upper mantle that are not subducted but are detached from the subducting block and either thrust up over continental crust or thrust directly beneath continental crust (Dewey and Casey, 2013). They can be over 10 km in thickness, and although they rarely exhibit the complete sequence, an ideal ophiolite would progress upward from upper mantle peridotite to lower crustal gabbro, to upper-crustal sheeted dikes, to pillow basalt, and finally to sedimentary rocks (Figure 1). In many cases, ophiolite sequences are found without the upper crustal components of sheeted dikes and sedimentary rocks.

The greatest challenge ophiolites present to geologists is how dense, oceanic upper-mantle and crust are lifted over less-dense continental rocks during subduction, when the same density differences are driving contrary processes at the same time. The process of emplacing ophiolite sequences is called "obduction," and it is thought to be able to move ophiolite suites laterally hundreds of km. It is a major mystery of uniformitarian geology (Oard, 2008). Like many such mysteries, geologists think that more time will solve fundamental problems of physics, and they cite slow tectonic forces as their solution. Agard et al. (2014, p. 132, emphasis added) recently stated:

> Within the frame of plate convergence, obduction (Coleman, 1971) is an apparent geodynamic *anomaly*, whereby fragments of dense oceanic lithosphere—"ophiolites," are emplaced onto light, deeply buried continental margins over distances of several hundred kilometers.

A related problem is the absence of modern analogues (Dilek, 2003). This proposed mechanism thus violates the principle of actualism, the methodological facet of uniformitarianism (Reed, 2010; 2011). Since Miall (2015) claims that uniformitarianism is still geology's fundamental principle, the lack of any modern analogue is troubling. Geologists may argue that it is an extension of the present-day process of subduction, and that it is a natural process, but neither subduction nor obduction is observed. To make interpretation even more difficult, ultra-high-pressure minerals and microdiamonds have been found in an ophiolite in Tibet, implying exhumation from depths up to 250 km (Yang et al., 2007)!

Ophiolites Relatively Common

These problems might be less daunting if ophiolites were rare, but they are

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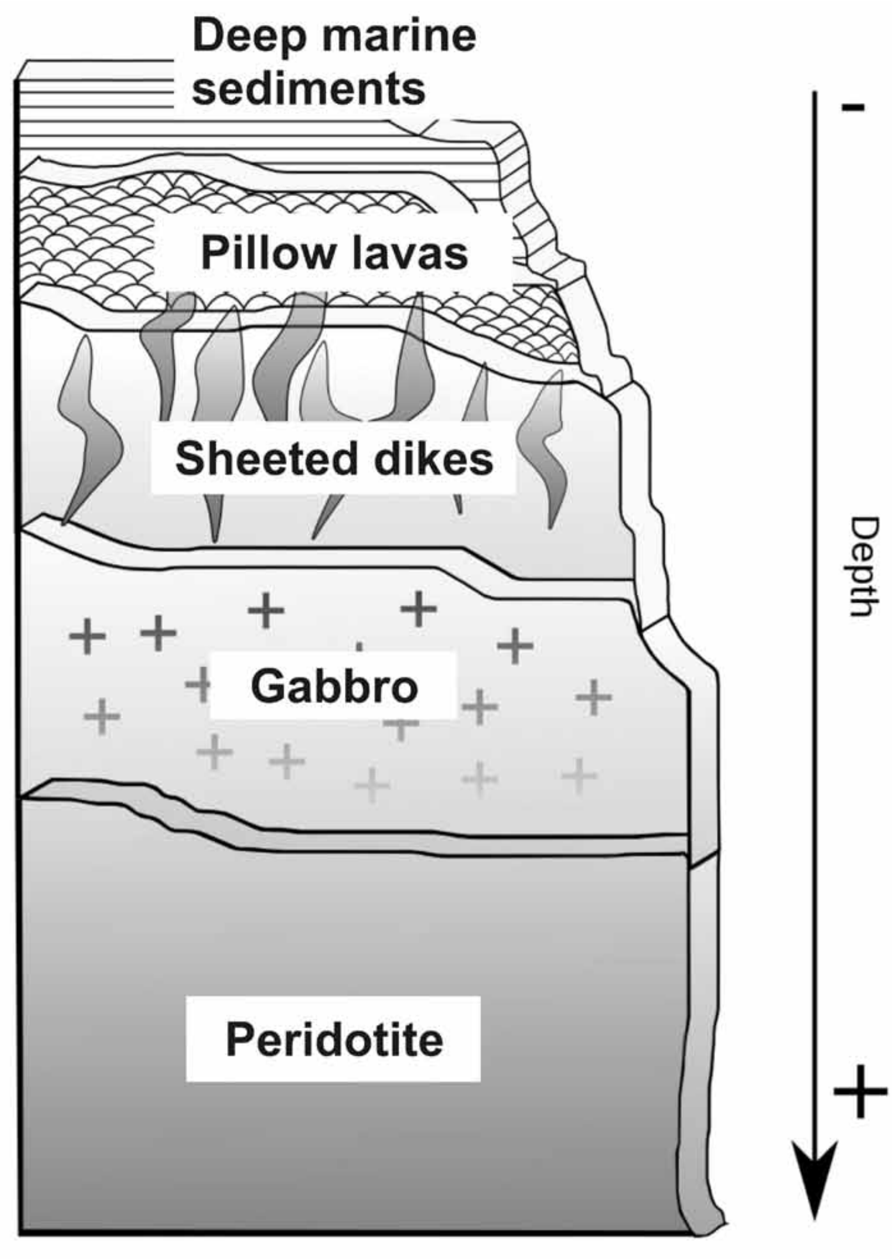

Figure 1. Idealized stratigraphic sequence of an ophiolite (Ofiolita.svg, Wikipedia Commons CC-BY-SA-3.0).

found in most major mountain belts, especially near coastlines (Wikipedia, 2015), such as coastal California and southwest Oregon. They are also found in interior mountains, such as the Alps and Himalayas. Ophiolites also occur in different "subduction settings," such as back-arc basins, island arcs, and forearcs. Back-arc basins are associated with subduction zones, forming opposite trenches across the magmatic zone, supposedly caused by partial melting of the subducting plate. Island arcs are volcanic zones thought to be caused by magma migrating up from the 100–150 km depth of the subducting plate. Forearcs are thick sediment accumulations, supposedly formed as they are "scraped" off of subducting plates. Forearc basins are troughs located between the trench and the magmatic arc.

Geologists have been trying to unravel the mysteries of ophiolites for 50 years (Dilek, 2003). Among the best studied are the Semail ophiolite in Oman and the UAE, the Troodos ophiolite on Cypress, and the Bay of Islands ophiolite on Newfoundland. Others are known in North America—from Vancouver Island, Washington, Oregon, and California to Arizona and even as far as New York (Wikipedia, 2015). Ophiolites have been discovered in the Balkans, Corsica, Iran, Pakistan, Turkey, Morocco, across the Himalayas, Tibet, India, the Philippines, Macquarie Island southeast of Tasmania, Papua New Guinea, New Caledonia, Japan, South Island New Zealand, the Andes, Brazil, Mexico, Baja California, Cuba, Mexico, and Puerto Rico.

Despite the problems, geologists commonly use ophiolites as a surrogate for deep ocean crust and upper mantle not yet reached by drilling and coring. The deepest borehole in oceanic crust is about 1.5 km; oceanic crust averages 6–7 km thick. This correlation necessarily maintains a level of uncertainty; it is based on the theoretical conclusion that ophiolites represent lower crust and upper mantle not directly sampled. However, that conclusion rests on the assumption that ophiolites represent present-day ocean crust. Some geoscientists question this use of ophiolites as surrogates for lower crust and upper mantle (Kearey et al., 2009).

Convoluted Models

Uncertainty is illustrated by the changing models of geologists. They once thought ophiolites formed at mid-ocean ridges but now think they form at subduction zones, based on their geochemistry (Shervais, 2001). For example, the largest ophiolite suite found, the Semail ophiolite, was originally thought to have formed at a mid-ocean ridge (MacLeod et al., 2013). Even if they do form at subduction zones, specific mechanics of ophiolite formation are poorly understood; many models have been proposed to account for their anomalous presence atop continental crust. Some think the horizontal force required to move them is supplied by a mantle superplume, others by an abrupt change in plate velocity, and some by a vertical reversal when continental crust thrusts under ocean lithosphere. The most popular current theory is that ophiolites form as a new mid-ocean ridge forms *above* a subduction zone! Here is part of the complex mechanism proposed by Dewey and Casey (2013, p. 715):

> In this way, an ophiolite complex is developed at a spreading centre within the fore-arc immediately above a subduction zone that allows the [island] arc to fore-arc lithosphere and trench to extend in a trench-parallel direction during spreading. As the arc and fore-arc grow in length, the dehydrating subducting plate hydrates the hot, low-pressure subridge adiabatic, upwelling, mantle melting zone at or near the spreading centre in the shallow wedge to enhance melting and generate boninites. Mantle is supplied to the ridge melting zone via corner flow from the rear of the arc.

The strongest evidence for their theory is a "sandbox experiment" in which materials of various densities were shortened by horizontal forces (Dewey and Casey, 2013). After 35 attempts, the researchers managed to obtain a result that showed continental subduction underneath ocean "lithosphere." However, caution is required due to the gross simplification and problems of scale—from a small box of material to actual crust covering hundreds of km. One of the main scale problems is that horizontal forces are dissipated rapidly, due to the low lateral strength of rocks, and the subsequent difficulty in transmitting forces through hundreds of km of rock.

Creationist Implications

Ophiolites are as much a mystery for Flood models. There are two main problems: the origin of the ophiolite bodies and the origin of the powerful lateral and vertical forces needed to move them. I have previously suggested a possible Flood mechanism, mainly meteorite impacts (Oard, 2008). A popular Flood model is catastrophic plate tectonics. How would this model account for ophiolite emplacement? Hunter (2009) suggested that ophiolites are mixtures of oceanic and continental lithosphere. In his model, hot mantle was brought to its melting point during the Flood, causing the Earth to expand between 95 and 100 km in diameter due to decompression. During this process, there was rapid differentiation and uplift of new ocean and continental crust. As with many other Flood models, this created a significant heat problem (Editor's Forum, 2009).

Ophiolites are found from the Archean to the late Cenozoic; a problem for Flood models assuming the validity of the geological column. Are Precambrian examples pre-Flood oceanic crust and upper mantle? Were Archean ophiolites formed during Creation Week (Snelling, 2009), and if so, why are they similar to Flood-emplaced examples? Or do they imply that Archean and Proterozoic rocks are from the Flood? Other unique Precambrian phenomena, including raindrop imprints, black shale, quartz arenite, and Precambrian impacts, reinforce that these Precambrian ophiolites are from the Flood (Oard, 1992, 2013, 2014).

If Precambrian ophiolites formed in a manner similar to Phanerozoic ophiolites, then the formation of new oceanic crust in the Mesozoic and Cenozoic by catastrophic plate tectonics is called into question. The existence of ophiolites suggests that there was no such replacement of oceanic lithosphere. It is even possible that ophiolites do not represent pre-Flood crust or even oceanic crust at all, since field examples are often missing members relative to the ideal sequence. Is it possible that ophiolites are simply uplifted or obducted mantle? Since scientists have not yet drilled sufficiently deep into oceanic crust, perhaps the compositional models of deep oceanic crust and the underlying mantle are skewed by the assumption that ophiolites represent that sequence.

The presence of ultra-high-pressure minerals (UHPm) in ophiolites, and the inferred vertical uplift of crust and mantle by up to 100 km, must also be explained (Oard, 2015). Meteorite impacts can also account for UHPm, but there have been few attempts to relate the two. Like many other aspects of Flood models, there is much research to be done.

Creationists need to think "outside the box" rather than accept interpretations of geologists and geophysicists, which rely heavily on uniformitarian paleoenvironmental interpretations that generate uncertainty in the current models. For example, the relatively recent idea that most ophiolites originate near subduction zones rather than the mid-ocean rifts suggests geologists do not know. Flood geologists face different uncertainties, especially extremely limited knowledge of the pre-Flood world and the exact processes occurring during the Flood. Some can be approximated by scaling up known processes, but some probably cannot. We must beware of these paleoenvironmental interpretations because the Flood environment was vastly different from those assumed by uniformitarianism (Oard, 1999).

Conclusions

Ophiolites are a mystery to both uniformitarian and Flood geologists. Continued research has not resolved the big questions, particularly in relation to their origin and emplacement. However, they are common, both geographically and stratigraphically. For that reason, more investigation is needed to unlock the mystery behind the patterns and processes involved in ophiolite origins and emplacement.

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Groundwater Sapping Does Not Support Millions of Years

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Abstract

Groundwater sapping, or simply *sapping*, is a slow process of erosion by which some canyons form. It is thought to take tens of thousands to millions of years; however, several classic examples of sapping are found to have been eroded by overland water transport. Examples of these include Box Canyon and Malad Gorge in south central Idaho, basalt canyons in Hawaii, canyons in the Atacama Desert and parts of the Colorado Plateau, including the Grand Canyon area. Overland flow can erode canyons rapidly, in harmony with the biblical timescale.

Introduction

Uniformitarian scientists have made a cottage industry over the past two centuries of finding geological processes that they claim require more time than the 6,000-year biblical timescale. Old-age processes include the formation of coal, oil, and natural gas and uniformitarianism became an established doctrine of earth science, even though the purported evidence was not compelling. Since that time, nearly all geological research follows that paradigm (Rudwick, 2005). Along with uniformitarianism came deep time, and the need for ever-increasing ages for the universe and Earth and its rock record. Geologists interpreted the rocks as products of long ages for that reason.

Creation scientists have demonstrated that most of these challenges have credible alternatives from a Flood perspective (Oard and Reed, 2009). For example, the Ice Age—once considered a challenge to creation science—is better explained as a natural consequence of the Flood (Oard, 2004a, 2013). Similar challenges remain, typically because we lack data or because creation scientists have not yet addressed them. Other problems are difficult to explain for both creationists and secular scientists. Secular research often highlights problems in older ideas. One example is the origin of canyons. For many years, vertically walled, amphitheater-headed canyons or box canyons have been attributed to slow groundwater sapping. New research suggests other origins, less dependent on long ages.

Sapping and the Origin of Large Canyons

Uniformitarian scientists believe that many vertically walled canyons formed by sapping, not by flowing water. Sapping (Figure 1) is a form of erosion and is defined as:

> The natural process of erosion along the base of a cliff by the wearing-away of softer layers, often involving weakening by groundwater conducted along the contact between rock strata, and thus removing the support for the upper mass which breaks off into large blocks falling from the cliff face. (Neuendorf et al., 2005, p. 574)

This process is too slow to create large canyons within the biblical timespan (Baker et al., 1990; Dunne, 1975). It relies on the rate of groundwater flow and physical weathering and erosion at seepage points. When this discharge of groundwater occurs at or near the base of a slope, it weakens the "foundation" of the wall. It is similar to water moving

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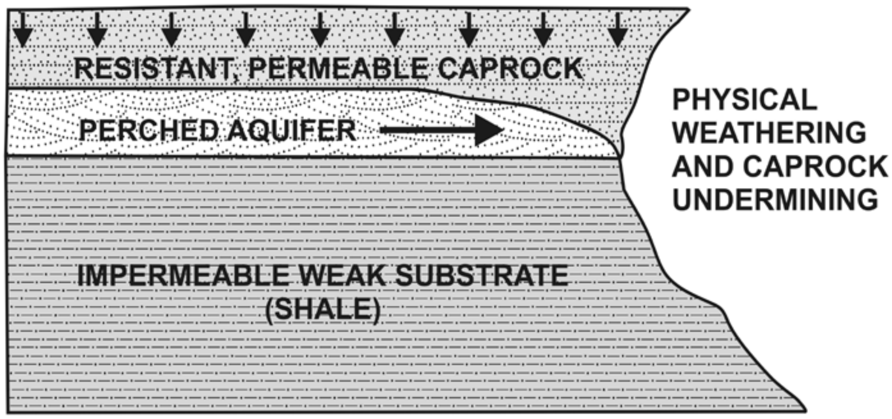

Figure 1. Diagram showing groundwater sapping. Groundwater flows above an impermeable layer and seeps out along a cliff face. As water seeps out, it erodes the sediment or sedimentary rock, weakening the caprock, which falls as blocks down the cliff.

Figure 2. Sapping features in wet sediment along the Colorado River in Grand Canyon (Courtesy of Tom Vail).

below the surface of sand at the beach (Figure 2). Sapping is very effective in soft, unconsolidated sediment (Lamb et al., 2006); however, it has yet to be shown that sapping is significant in hard rock.

> For example, groundwater sapping is a key process in forming amphitheater-headed canyons in *unconsolidated sand* … but its importance is controversial in rock. (Lamb et al., 2014, p. 57, emphasis mine)

Therefore, sapping as the primary canyon-forming process in hard rock areas should be questioned. Other mechanisms may better explain their origin, especially in a short time frame. For example, many large canyons have been formed by overland flow during large floods, like those of the Channeled Scablands. Sapping may contribute to further erosion, but canyons once considered classic examples of sapping may have been formed entirely by overland flow or other processes.

Many geologists, however, still believe that many canyons were formed by sapping, including many on the Colorado Plateau (Howard et al., 1988; Laity and Malin, 1985), deep canyons carved in basalt in Hawaii (Kochel and Piper, 1986), and even some of the canyons on Mars (Malin and Carr, 1999). Ongoing, slow sapping today is taken as evidence that it was the primary cause of canyon formation.

Some small canyons, such as the one shown in Figure 3, likely were enlarged by sapping (Froede and Williams, 2004; Williams, 1995). But the major canyon-forming process was probably another process, such as overland flow. Lamb et al. (2006, p. 3, emphasis mine) state: "It is difficult to observe seepage erosion in bedrock because, *if it occurs*, it requires long timescales."

Box Canyon, Idaho, Not Formed by Sapping

Box Canyon is a tributary canyon to the Snake River, carved into the hard, impermeable Snake River basalt flows in south central Idaho (Lamb et al., 2008; Oard, 2010). Box Canyon has vertical walls 35 m high, a width of 120 m, and is 2.68 km in length (Figure 4). Today, a

Figure 3. A small canyon in northeast Arizona probably enlarged by sapping.

Figure 4. A view of Box Canyon, just off the Snake River in Idaho, which may have formed by a Flood according to Michael P. Lamb. (Google Earth image).

Figure 5. Malad Gorge (Google Earth image).

stream flows through the canyon with a discharge of 10 m^3/second. Box Canyon is thought to be a classic example of long, slow erosion by sapping; however, this interpretation has many problems.

First, talus, expected where groundwater undercut cliffs, is scarce at the head of the canyon. Second, the canyon also has waterfall plunge pools and waterfall spill points on the headwall rim, showing that overland flow has occurred in the past. Third, the upper kilometer of the canyon is scoured, not undercut and collapsed. Finally, the present-day large spring that feeds the stream is not causing visible erosion. Therefore, a better interpretation of Box Canyon is that it formed rapidly during a megaflood of either the Little River or Big Wood River to the north, or on the Big Lost River (Cerling et al., 1994). Such a flood could have been caused by catastrophic Ice Age melting or the upstream breaching of an ice dam.

Malad Gorge, Idaho, Not Formed by Sapping

Malad Gorge is also a tributary of the Snake River, carved into the nearly flat Snake River basalt plain of south central Idaho (Lamb et al., 2014). Many geologists think it is another classic example of slow erosion by sapping, but the gorge was carved through multiple basalt flows. It has three distinct canyon heads; two are 50 m high, vertical amphitheater-shaped heads, and the third has a 7% grade or "knickzone," composed of multiple steps. A *knickzone* is a series of knickpoints causing an interruption in the slope of a stream. The two amphitheater canyons rarely experience any overland flow, and a small spring issues from the side of one canyon. The canyon with the knickzone carries the small Wood River, which originates in the mountains of central Idaho. There is substantial evidence of another origin for Malad Gorge.

Erosional scour is present upgradient of the two amphitheater canyons, indicating overland *megaflooding* in the past. Malad Gorge is only 18 km north of Box Canyon (Figure 5), and the same megaflood could have carved both. Canyon headwalls at Malad Gorge display notches that suggest *plucking*, an erosional process that removes large blocks from the substrate in a powerful current. Large plunge pools, found at the bottom of the canyon heads, are similar to those found at the base of "dry

Figure 6. The Potholes, plunge pools created by a receding waterfall 100 m high when the Lake Missoula flood overtopped a ridge west of Ephrata, Washington.

Figure 7. Upper Grand Coulee and Banks Lake with its 275 m high, vertical cliffs and flat bottom was carved during the Lake Missoula flood.

falls" produced by the Lake Missoula flood (Figure 6) (Oard, 2004b, 2014). Large boulders, up to 3 m in diameter, were transported along the low gradient of the canyon bottom. This would require a minimum discharge of 1,250 m^3/s, flowing at a depth of 9 m—seven times the highest flow measured on Wood River.

Erosion by megaflooding eliminates the need for long periods of sapping, and the abrupt catastrophic formation of the landscape suggests that uniformitarian perspectives are deficient in this area of geomorphology. It also suggests greater unpredictability in the rock record and less certainty in geologic history.

Box Canyon and Malad Gorge Carved by Megaflood after Noah's Flood

The rapid formation of Box Canyon and Malad Gorge by megaflood erosion, rather than by sapping, eliminates another objection of secular science to biblical history. Although these canyons may have formed during late-Flood channelized erosion (Oard, 2008), it is more likely they formed during the Ice Age, possibly after the Lake Bonneville flood, given the depth and direction of the canyons entering the Snake River.

Box Canyon and Malad Gorge are downstream from post-Flood Lake Bonneville, formed by ponding of Flood runoff and deepened by high precipitation during the Ice Age (Oard, 1993). It was a large, deep lake in Utah, about six times the area of Great Salt Lake and up to 345 m deep, nearly a hundred times more than the 3.5 m-deep Great Salt Lake. As Lake Bonneville rose, it overflowed Red Rock Pass at the southeast Idaho/Utah border, creating a breach that deepened the pass by about 100 m (O'Connor, 1993) during the Lake Bonneville flood. This event carved the channel of the Snake River Valley and formed local scabland features similar to those in eastern Washington. Since the tributary canyons of Malad Gorge were eroded to the same level as the Snake River and are not hanging valleys, the Snake River had to have been initially deepened by the Bonneville flood. This places the formation of Malad Gorge and Box Canyon well after Noah's Flood.

What, then, was the source of the water that carved Box Canyon and Malad Gorge? Their vertical walls, eroded into hard basalt, indicate significant volume and energy, like the Lake Missoula flood (Figure 7) (Oard, 2004b, 2014). At present, we cannot constrain the exact timing of this flood without a more detailed analysis of the area north of the canyon. One plausible uniformitarian explanation is that a flood broke a lava dam across the Wood River. Some basalt flows on the Snake River plain erupted after the Genesis Flood, and one of them could have created a dam. The Snake River basalts are thick and extensive, like the Columbia River Basalts. But the angular, rough lava at the Craters of the Moon and similar features indicate later volcanic activity on the Snake River basalt plain (Figure 8). It is also possible that Malad Gorge was carved by an arm of the Big Lost River flood (Cerling et al., 1994) when a glacial dam broke, flooding the area east of Wood River. In either case, erosion would have been within the biblical timescale.

Figure 8. Relatively recent basalt flow at the Craters of the Moon National Monument and Preserve.

Hawaiian Canyons Not Formed by Sapping

One of the most cited examples of sapping in basalt is the formation of spectacular amphitheater-headed valleys on the Hawaiian Islands (Howard et al., 1988). Lamb et al. (2007) analyzed four of them on the northeast side of Kohala Volcano on the island of Hawaii (Figure 9). Kohala is a small volcanic cone about 1,600 m high. Valleys between 300 and 750 m deep have been eroded into its sides. These extend to the northeast and terminate at a seaside cliff.

Although thought to have formed by sapping, these valleys show no evidence of intensely weathered rocks or alcoves around springs flowing from the valley headwalls. Springs are common due to high precipitation, but they often occur high on the valley walls, not at the intersection of the walls and valley floors. Springs have also emerged from the sea cliff that have not produced valleys. Moreover, plunge pools indicate overland flow. It is more likely that the canyons originally formed by the retreat of waterfalls (like the Niagara Falls) or from overland flooding during heavy rains. The same would be true of many other valleys on the Hawaiian Islands and is supported by their location on the *wet* side of the islands. This further suggests that the amphitheater morphology is *not* diagnostic of sapping. If so, the uniformitarian model is flawed.

Atacama Desert Canyons Not Formed by Sapping

Amphitheater-headed canyons in the hyper-arid Atacama Desert of northern Chile have been ascribed to sapping, based on analysis of the shape of their headwalls from satellite images (Hoke et al., 2004). These canyons range from V-shaped to trapezoidal in cross section, possess few tributaries, have low sinuosity, undergo little downstream widening, and are flanked by uplands that show little dissection, indicating that they were carved into a large planation surface (Mortimer and Sarič, 1975; Irwin et al., 2014). These large canyons are kilometers wide and hundreds of meters deep. Intermittent runoff from

Figure 9. Panorama of the Kohala Volcano with its deep canyons on the island of Hawaii (USGS, Wikipedia Commons PD USGS).

the high Andes is the only apparent significant water source for most of the valleys.

A field analysis of two of these canyons revealed *no* signs of sapping. There were no alcoves, no springs, no spring-watered vegetation, or any salt-weathering. However, signs of runoff erosion were evident. Canyon floors have been sculpted by fluvial channels, and boulders up to 2 m in diameter have been rounded by flowing water. Although sapping may have occurred in the past, it does not appear to be a major factor in their formation. Another valley, not analyzed in the field, is so wide that it likely originated by mass wasting, similar to that which formed the "Little Grand Canyon" at Mount St. Helens. Today, Little Grand Canyon is a 25 m deep canyon with a small stream running through it (Morris and Austin, 2003). It demonstrates rapid formation—in one day.

Colorado Plateau Canyons Not Formed by Sapping

The Colorado Plateau is rightly famous for its many long, amphitheater-headed canyons, including Grand Canyon. Many of these are assumed to have formed by sapping (Howard et al., 1988; Laity and Malin, 1985). This area is considered one of the best locations to see sapping:

> Excellent examples of sapping valleys have been described: (1) on the Colorado Plateau, where massive sandstone units are eroded by perched water emerging from bedding-plane boundaries; and (2) in the Hawaiian Islands, where basalt flows flanking shield volcanoes are dissected by both runoff and sapping valleys. (Baker et al., 1990, p. 235)

As with many forensic theories of earth history, however, much of the interpretation revolves around fitting observations into preconceptions of mechanisms. "Almost all the literature on landforms produced by groundwater sapping is descriptive" (Howard et al., 1988, p. 3). They continued to discuss the Colorado Plateau:

> From the preceding discussion it should be evident that our understanding of the processes involved in sapping erosion is fragmentary, and that it is difficult to make conclusive statements about the past and present roles of sapping processes in scarp evolution on the Colorado Plateau. (Howard et al., 1988, p. 49)

Sapping erosion is real and probably contributes to the present-day, small-scale formation of features in canyons. It is a major factor in the rapid growth of Providence Canyons in Georgia, which began with erosion from overland flooding (Froede and Williams, 2004; Williams, 1995). However, the more obvious cause of canyon erosion is that of overland flow, especially during flooding (Lamb et al., 2006). One of the indicators of this mechanism is the absence of talus in canyons. Flooding would remove the talus; sapping would leave many signs of activity:

> While some seepage weathering due to salt precipitation clearly takes place in the Colorado Plateau, spring flow is not able to remove boulders and gravel that tumble onto the canyon floor.… Precipitation-induced runoff is probably necessary to remove these gravels. (Lamb et al., 2006, pp. 2, 3)

Furthermore, there are many examples of groundwater flow in locations that could produce sapping but no evidence of actual erosion. Also, the presence of plunge pools is a clear indication of high volumes of overland flow. At Grand Canyon, the tributaries on the north side are longer, as would be predicted if formed by overland water:

> Although seepage erosion may play a minor role in valley extension within the Kaibab and Redwall Limestones, the main processes of canyon erosion and extension are runoff erosion and debris flow incision.… The tributaries on the north side of the Colorado River have eroded farther due to extensive drainage from the highlands north of the Grand Canyon passing over the canyon rim. (Lamb et al., 2006, p. 14)

The canyons on the Colorado Plateau probably were first eroded by late Flood-channelized flow when Grand Canyon formed (Oard, 2011, 2016). Greater Flood runoff would be expected from the Grand Staircase to the north. Canyons probably increased in size during heavy Ice Age precipitation (Oard, 1993) and summer flash floods after the Ice Age.

Conclusion

Although sapping may be a minor mechanism of erosion in hard rock, evidence demonstrates that large canyons were more likely formed by overland flow. Classic examples are cited because of the shape of the amphitheater-headed canyons, but clear field evidence of significant erosion by overland flow is ignored. Although uniformitarians consider sapping a major factor in canyon erosion, it is possible that it contributes very little to erosion processes in hard rock locales:

> The latter studies suggest that a ground-water sapping origin of bedrock valleys may not have been uniquely demonstrated *anywhere* on Earth, and that a positive relationship between spring discharge and weathering rate similarly lacks empirical support. (Irwin et al., 2014, p. 297, emphasis mine)

Uniformitarians continue to offer objections to biblical history based on mechanisms that require deep time. But once again, the evidence shows that the time is not necessary and that the explanatory model is distorted by the presumption of deep time and the need to find processes to fit that template.

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The "Pacemaker of the Ice Ages" Paper Revisited: Closing a Loophole in the Refutation of a Key Argument for Milankovitch Climate Forcing

Jake Hebert*

Abstract

The 1976 "Pacemaker of the Ice Ages" paper by Hays, Imbrie, and Shackleton largely convinced the secular scientific community that Earth's orbital and rotational motions are affecting climate. The authors performed power spectrum analyses on variables of presumed climatic significance within two deep-sea Indian Ocean sediment cores, analyses that showed dominant spectral peaks at frequencies corresponding to calculated 100-, 41-, and 23-thousand-year astronomical cycles. Previous research showed serious problems with this paper, as it implicitly assumed an age of 700 thousand years for the Brunhes-Matuyama (B-M) magnetic reversal boundary, rather than the currently-accepted age of 780 thousand years. Furthermore, secular scientists have argued for the existence of discontinuities in the cores that were used either directly or indirectly in the analyses, and they have also made modifications to the data sets used in the Pacemaker analysis. When all these changes are taken into account, the Pacemaker analysis provides no convincing support for the currently-accepted version of the Milankovitch hypothesis. In fact, agreement with Milankovitch expectations is worse than the previously published new results obtained using the reconstructed original data sets.

Introduction

The astronomical (or Milankovitch) hypothesis is the currently dominant secular explanation for the fifty or so Pleistocene ice ages said to have occurred within the last 2.6 million years (Walker and Lowe, 2007). Although the theory has many serious problems (Oard, 2005, 2007, 2014; Cronin, 2010), it is now widely accepted on the basis of a 1976 paper published in *Science* entitled "Variations in the Earth's Orbit: Pacemaker of the Ice Ages" (Hays, Imbrie, and Shackleton, 1976). Because the astronomical hypothesis of climate forcing implicitly assumes

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the existence of "deep time," the Pacemaker paper has become not just a key argument for the astronomical hypothesis, but an iconic argument for an old Earth as well. The significance of the Pacemaker paper is indicated by the fact that both *Nature* and *Science* published articles commemorating its fortieth anniversary (Maslin, 2016; Hodell, 2016).

Hays, Imbrie, and Shackleton performed spectral analyses on three variables within two southern Indian Ocean deep-sea sediment cores designated as RC11–120 and E49–18. These three variables were the oxygen isotope ratios (denoted by the shorthand notation $\delta^{18}O$) of the foraminiferal species *Globigerina bulloides*, the percent abundance of the radiolarian species *Cyclodophora davisiana*, and (southern hemisphere) summer sea surface temperatures, also inferred from radiolarian data. The results showed climate cycles corresponding to periods of 100, 42, and 23 thousand years (100, 42, and 23 ka). They also showed evidence of a 19 ka cycle, although others (Muller and MacDonald, 2000, pp. 74–78) have argued that this apparent cycle was not "real." Since orbital calculations show dominant cycles having nearly those same lengths (100, 41, and 23 thousand years), the Pacemaker paper was seen as strong evidence for the hypothesis of Milankovitch climate forcing.

However, the original Pacemaker results are invalid (Hebert, 2016c), even by uniformitarian reckoning, due to a significant age revision made by uniformitarian scientists in the early 1990s. In order to better understand the methodology of the Pacemaker paper and why its results are invalid, it is necessary to first cover some background material. Readers already familiar with the concepts of oxygen isotope ratios and Marine Isotope Stages (MIS) may wish to skip the following two sections.

Background: Foraminiferal Oxygen Isotope Values

Microscopic marine creatures called foraminifera construct shells, or tests, that are composed of calcium carbonate ($CaCO_3$). Planktonic foraminifera float freely in the water column (Mortyn and Charles, 2003), whereas benthic foraminifera live on or in the seafloor sediments (Kingston, 2010). When these organisms die, their shells contribute to the debris accumulating on the ocean floor. Scientists often measure the ^{18}O and ^{16}O isotopes in a foraminiferal shell and use this to calculate a quantity called the oxygen isotope ratio, indicated by the symbol $\delta^{18}O$. These values are reported relative to a standard $\delta^{18}O$ value, in units of parts per thousand ("per mille," or ‰):

$$\delta^{18}O = \frac{\left(^{18}O/_{16}O\right)_{\text{sample}} - \left(^{18}O/_{16}O\right)_{\text{standard}}}{\left(^{18}O/_{16}O\right)_{\text{standard}}} \times 1000\,‰ \qquad (1)$$

Evaporation preferentially favors the removal of 'lighter' isotopes (such as ^{16}O) from a reservoir of oxygen atoms (such as water molecules in an ocean), and this preferential evaporation is more pronounced at lower temperatures. Hence, during an ice age, one would expect the oceans to be more depleted in ^{16}O, or equivalently, more enriched in ^{18}O, compared to some standard value. Since foraminifera use oxygen atoms to make their shells, one thus expects higher $\delta^{18}O$ values in shells constructed by foraminifera during an ice age. Therefore, the oxygen isotope signal within a sediment core is thought to be a climate indicator, with higher $\delta^{18}O$ values indicating colder temperatures or, more precisely, times of high global ice volume (Wright, 2010). Likewise, lower $\delta^{18}O$ values within the sediments are thought to indicate times of low global ice volume. Conversely, higher (less negative) $\delta^{18}O$ values within ice cores are thought to correspond to times of less global ice volume, and lower (or more negative) $\delta^{18}O$ values are thought to correspond to times of greater global ice volume. Of course, creation scientists have long pointed out issues that complicate this simplistic understanding of seafloor sediment and ice core $\delta^{18}O$ values (Oard, 1984; Vardiman, 1997).

Nevertheless, the Pacemaker authors used planktonic oxygen isotope ratios from the two Indian Ocean sediment cores in their analysis (Hays, Imbrie, and Shackleton, 1976). This is potentially problematic, since planktonic $\delta^{18}O$ values are much more susceptible to short-term, local temperature and chemical variations than benthic $\delta^{18}O$ values (Oard, 1984; Karner et al., 2002, p. 1). Hence, it may not represent a truly global climate signal, even within a uniformitarian framework. However, we here overlook this potential difficulty and focus on other problems with the Pacemaker paper.

Background: Marine Isotope Stages

Because uniformitarian scientists believe that this oxygen isotope signal is a global climate indicator (Prell et al., 1986, p. 137), they believe that, in theory, the oxygen isotope signal, plotted as a function of depth, for one sediment core should look basically the same as the oxygen isotope signal for another sediment core. Of course, uniformitarians recognized that in actual practice this will rarely be the case; changes in sedimentation rates, local weather effects, post-depositional processes, etc., can obscure or distort this idealized signal. Nevertheless, if oxygen isotope features can somehow be accurately dated in one sediment core, uniformitarian scientists believe that it should be possible to transfer those ages to (presumed) corresponding oxygen isotope features in another sediment core (Figure 1).

In order to facilitate this "wiggle matching" process, uniformitarian scientists devised a concept called marine

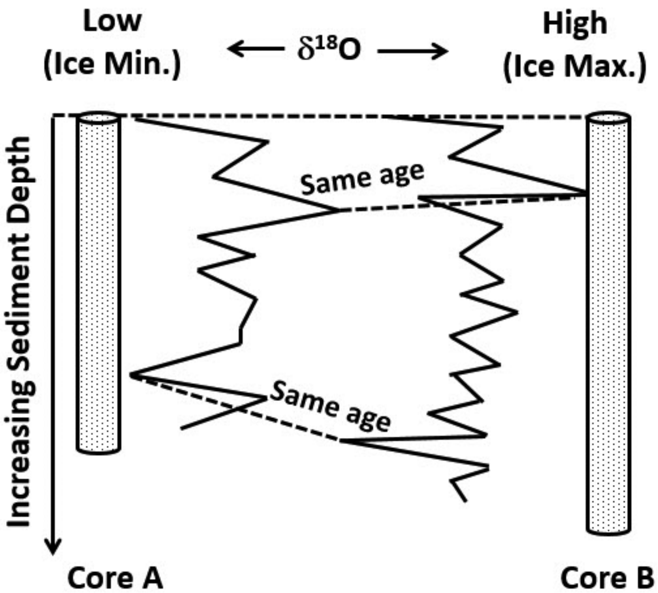

Figure 1. Because uniformitarian scientists believe that the oxygen isotope ($\delta^{18}O$) signal is a global climate indicator, they assume that similar $\delta^{18}O$ features in different sediment cores are the same age (provided that the $\delta^{18}O$ signals in the cores have not been distorted by local weather effects, post-depositional processes, etc.).

isotope stages (MIS). Generally, but with some exceptions, odd-numbered marine isotope stages indicate warm periods (interglacials), and even-numbered marine isotope stages denote ice ages (glacials). The boundaries between marine isotope stages are generally located at depths at which the $\delta^{18}O$ signal has transitioned halfway from a local minimum to a local maximum, or *vice versa* (Gibbard, 2007). Prominent features within a particular marine isotope stage are indicated with a number following a decimal. Particularly low $\delta^{18}O$ values within a marine isotope stage (indicating times of relative warmth within a glacial or interglacial) are indicated by odd numbers after the decimal, whereas particularly high $\delta^{18}O$ values within the MIS (indicating times of relative coolness in a glacial or interglacial) are indicated by even numbers after the decimal, with the post-decimal numbers decreasing as one moves up the core toward younger ages. For instance, MIS 5 is thought to contain three dominant $\delta^{18}O$ troughs, labelled as 5.1, 5.3, and 5.5, with 5.1 being the youngest and 5.5 being the oldest. Originally, the entirety of MIS 5 was thought to be an interglacial, but now uniformitarian scientists argue that this is only true of MIS 5.5. MIS events 5.1 and 5.3 have since been grouped together with MIS 2, 3, and 4 and counted as representing the most recent ice age (McManus et al., 1994, p. 326). By convention, MIS boundaries between two marine isotope stages are indicated by the number of the earlier stage followed by a decimal and a zero. For instance, the boundary between stages 1 and 2 is denoted as MIS 2.0

Age Assignments for the Pacemaker Paper

Prior to performing their analyses, the Pacemaker authors had to assign tentative timescales to the two Indian Ocean cores. Even uniformitarians acknowledge that, with some exceptions (e.g., radiocarbon dating of the uppermost sediments and uranium series dating), radioisotope dating methods cannot be used to directly date seafloor sediments. Hence, they had to use a "backdoor" approach to obtain these preliminary age-scales. Potassium-argon dating had previously been used to assign an age of 700 ka to volcanic rocks recording what was believed to be the most recent "flip" or "reversal" of the earth's magnetic field, the Brunhes-Matuyama (B-M) magnetic reversal (Shackleton and Opdyke, 1973).

Uniformitarians believe that magnetic reversals occur slowly, taking on average about seven thousand years, although with a large degree of latitude-dependent variation (Clement, 2004). However, uniformitarian scientists themselves have claimed evidence for multiple, extremely rapid, past magnetic reversal events (Coe, Prévot, and Camps, 1995; Bogue and Glen, 2010; Sagnotti et al., 2014). Hence, the evidence would seem to strongly favor rapid magnetic reversals, which are quite unexpected in the uniformitarian framework. Creation scientists associate these reversals with the upheaval of the Genesis Flood and argue that the apparent erratic timing of the reversals is a consequence of an incorrect uniformitarian timescale (Humphreys, 1986, 1990).

Since seafloor sediments contain magnetic minerals, they can, in principle, also record these magnetic reversals. Therefore, uniformitarians transferred this age of 700 ka to the most recent apparent magnetic reversal (located at a depth of 1200 cm) within the western Pacific core V28–238 (Hays, Imbrie, and Shackleton, 1976; Shackleton and Opdyke, 1973). The V28–238 core is extremely important to uniformitarian scientists because of the (presumed) very constant rate at which its sediments were deposited; its deposition rate was thought to be the most constant of any deep-sea cores then in existence (Shackleton, Berger, and Peltier, 1990, p. 258). Hence, if the age of the top of the V28–238 core were known, uniformitarian scientists could then use the assumption of a constant sedimentation rate to assign ages to the marine isotope stage boundaries within the V28–238 core, and, since the isotopic signal was assumed to be globally synchronous, these ages could then be transferred to the oxygen isotope signals in *other* sediment cores. Because of its importance, the isotope record in the V28–238 core has been called a kind of ice age "Rosetta Stone" (Woodward, 2014, p. 97). The Pacemaker authors transferred some of these MIS boundary ages to the (presumably) corresponding isotopic features in the RC11–120 and E49–18 Indian Ocean cores.

However, in the early 1990s, uniformitarian scientists arbitrarily raised the age of the B-M magnetic reversal boundary to 780 ka (Shackleton, Berger, and Peltier, 1990; Hilgen, 1991) so that isotopic wiggles in *other* sediment cores would agree with Milankovitch expectations! This revision was later ostensibly "confirmed" by radioisotope dating (Spell and McDougall, 1992). However, uniformitarians never went back to see what this age revision would do to the original Pacemaker results. Hebert (2016c) used Shackleton and Opdyke's (1973) method to recalculate the ages for the marine isotope stage boundaries using this new age assignment and then re-performed the Pacemaker calculations. The results showed that this age revision significantly weakened the case for Milankovitch climate forcing.

In fact, there is a "shortcut" by which even non-specialists can quickly verify that these new results are at least approximately correct (Hebert, 2017a, c, d), using nothing more than a pocket calculator and basic high school algebra. Furthermore, there are good reasons to suspect that uniformitarian scientists do not have a good "replacement" for the Pacemaker paper (Hebert, 2017b), which means that there is no objective evidence for the astronomical theory (hypothesis, really), even within a uniformitarian framework.

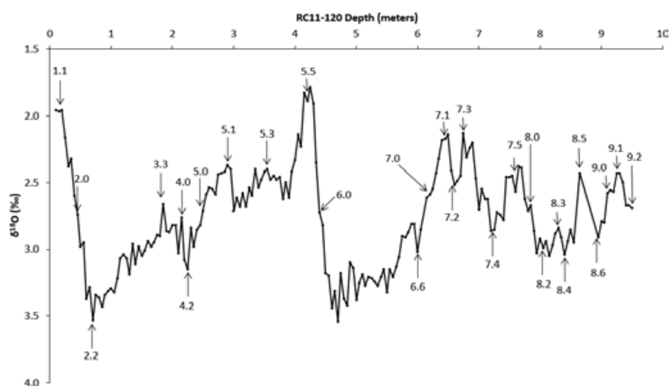

Figure 2. RC11–120 $\delta^{18}O$ values and MIS events.

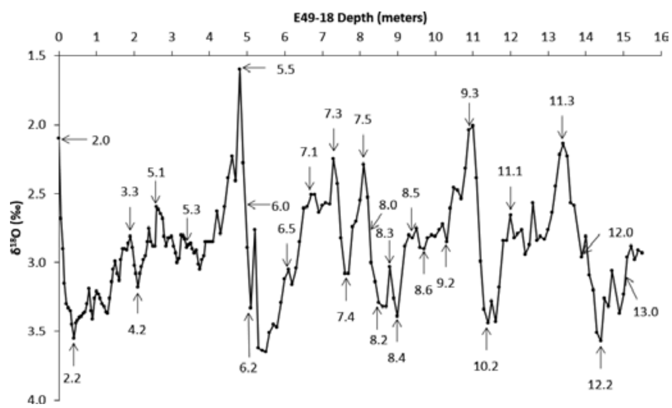

Figure 3. E49–18 $\delta^{18}O$ values and MIS events.

Revised Data Values

However, uniformitarians have made other changes that conceivably could also have affected the results of the Pacemaker analysis. For the sake of rigor, these additional changes should also be taken into account when redoing the calculations.

First, uniformitarians have made additional measurements within the RC11–120 and E49–18 cores, and these newer measurements sometimes disagree somewhat with the older measurements. For this analysis I used the most recent publicly available versions of the relevant data sets I could find. For the RC11–120 $\delta^{18}O$ values, I used the data of McIntyre and Imbrie (2000), accessed at https://doi.pangaea.de/10.1594/PANGAEA.56357?format=html#download. These data are shown in Figure 2.

For the E49–18 $\delta^{18}O$ data, I merged the 10 cm resolution data from Hays, Imbrie, and Shackleton (1997) with Rickaby and Elderfield's (1999) higher resolution (5 cm) data for the uppermost core section. These data sets were accessed at https://doi.pangaea.de/10.1594/PANGAEA.52207 and ftp://ftp.ncdc.noaa.gov/pub/data/paleo/paleocean/sediment_files/complete/e49–18r-tab.txt.

Actually, the values reported by Hays, Imbrie, and Shackleton (1997) in the upper core section were themselves the simple averages of the values reported by Rickaby and Elderfield (1999). Hays, Imbrie, and Shackleton reported two different $\delta^{18}O$ values (2.99‰ and 2.86‰) at a depth of 15.5 meters, so I used the simple average (2.93‰) of these two values at that depth. These data are shown in Figure 3.

Likewise, I used the RC11–120 SST values provided by Hays, Imbrie, and Shackleton (1997), which were archived at https://doi.pangaea.de/10.1594/PANGAEA.52223?format=html#download. SST values for the E49–19 core were provided by Howard and Prell (1992) and accessed at https://www1.ncdc.noaa.gov/pub/data/paleo/paleocean/sediment_files/sst/e49–18_ssts-tab.txt . Unlike the previous SST estimates, these new E49–18 SST estimates were based on foraminiferal, rather than radiolarian, data. However, the new SST estimates were generally "in phase" with the previous temperature estimates (Hebert, 2016a).

The SPECMAP values of the percentages of *C. davisiana* values within the RC11–120 core were provided by Martinson et al. (1987), and these were accessed at https://doi.pangaea.de/10.1594/PANGAEA.51706?format=html . For the percentages of *C. davisiana* within the E49–18 core, I used my values, which I reconstructed from Figures 2 and 3 in the Pacemaker paper (Hebert, 2016a, Table A6), as I could not find a compilation of these values elsewhere.

Alleged Core Discontinuities

Uniformitarians originally claimed that continuity of the V28–238 core was "virtually proved" (Emiliani and Shackleton, 1974, p. 513). However, they later reversed themselves and claimed that V28–238 had been disturbed within marine isotope stages 5 and 11 (Imbrie et al., 1984; Prell et al., 1986). However, the supposed discontinuity in stage 5 was not considered significant, as Prell et al. (1986, p. 149) did not attempt to correct for it. However, they did correct for supposed stretching of the core in stage 11; in order to compensate for this, three "extraneous" data points were removed (Prell et al., 1986, p. 149), causing depths below 723 cm in V28–238 to be decreased by 30 cm (Imbrie et al., 1984, p. 288). In some cases, uniformitarians revised these depth estimates slightly. See online V28–238 data archived at https://doi.pangaea.de/10.1594/PANGAEA.51710?format=html#download, which I used to construct my Figure 4. I also used these data, along with the data from Prell et al. (1986, pp. 144–148), to construct my Table 1. All MIS events in Table 1 came from Prell et al. (1986), with the exception of MIS events 13.0 and 13.1. Although Prell et al. (1986, p. 146) claimed that the MIS 13.0 boundary was "difficult to pick," my identification of a depth of 781 cm with this boundary seems reasonable, given that Prell et al. identified the positive $\delta^{18}O$ peak to the right as MIS 13.2 and the $\delta^{18}O$ trough to the right of 13.2 as 13.3. Given those two choices, it seems obvious that the $\delta^{18}O$ trough to the left of MIS 13.2 (at a depth of 802 cm) should be MIS 13.1. And if that is the case, what else can the depth of 781 cm be but MIS 13.0?

These depth revisions alter the apparent depths of many of the MIS boundaries in V28–238. Likewise, the apparent depth of the B-M magnetic reversal boundary is revised to 1200 cm – 30 cm = 1170 cm (Prell et al., 1986, p. 148). Naturally, these revisions will alter the presumed ages for those MIS boundaries. Figure 5 illustrates Shackleton and Opdyke's (1973) method for obtaining the ages for the MIS boundaries but uses new depth values and the revised age for the B-M reversal boundary. As noted earlier, Figure 4 depicts the V28–238 $\delta^{18}O$ signal plotted as a function of these adjusted depth values.

Of course, one should consider the possibility that there might also be hitherto unnoticed discontinuities in the RC11–120 and E49–18 cores as well. This is addressed in the following sections.

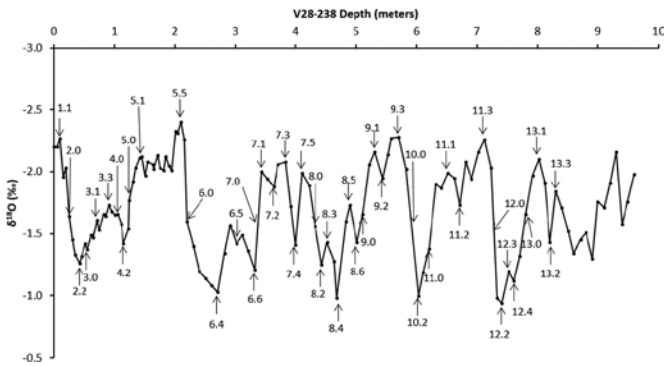

Figure 4. V28–238 $\delta^{18}O$ values as a function of revised depth values, with indicated marine isotope stage (MIS) events.

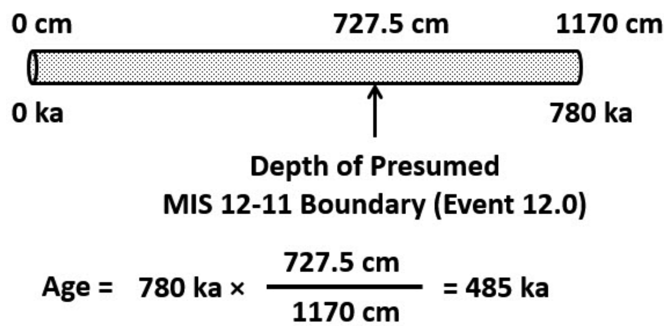

Figure 5. Demonstration of the method used by Shackleton and Opdyke (1973) to assign ages to the V28–238 marine isotope stage (MIS) boundaries, but using the revised age of the Brunhes-Matuyama magnetic reversal boundary and revised depths for the V28–238 data. Hays, Imbrie, and Shackleton used a handful of these (unadjusted) ages in their famous 1976 "Pacemaker of the Ice Ages" paper.

Checking For Discontinuties in RC11–120 and E49–18: Shaw Diagrams

Correcting for these supposed discontinuities within the V28–238 sediment core should theoretically yield a plot of $\delta^{18}O$ versus depth that suffers from no remaining distortions. In that case, the assumed age of 0 ka at the core top would imply that the

Table 1. Depths of marine isotope stage events (up to 13.3) in the V28–238 deep-sea core, after accounting for the revisions described by Imbrie et al. (1984) and Prell et al. (1986).

MIS Event	V28–238 Min. Depth (cm)	V28–238 Most Likely Depth (cm)	V28–238 Max. Depth (cm)
1.1	5	10	15
2.0	15	25	30
2.2	35	42	45
3.0	45	55	65
3.1	62	71	75
3.3	85	91	101
4.0	101	105	115
4.2	111	115	123
5.0	123	125	135
5.1	135	145	151
5.5	201	210	215
6.0	215	220	251
6.4	261	271	282
6.5	282	302	322
6.6	322	332	343
7.0	332	337.5	343
7.1	332	343	353
7.2	353	364	370
7.3	364	383	392
7.4	392	399	410
7.5	399	410	432
8.0	422	432	443
8.2	432	443	452

MIS Event	V28–238 Min. Depth (cm)	V28–238 Most Likely Depth (cm)	V28–238 Max. Depth (cm)
8.3	443	452	463
8.4	463	468	483
8.5	483	489	501
8.6	489	501	511
9.0	501	511	522
9.1	522	531	543
9.2	531	543	552
9.3	552	571	583
10.0	583	593	603
10.2	595	603	611
11.0	611	620	641
11.1	632	652	663
11.2	663	671	691
11.3	691	712	722
12.0	722	727.5	733
12.2	733	741	752
12.3	741	752	761
12.4	752	761	771
13.0	741	781	792
13.1	781	802	821
13.2	812	821	830
13.3	821	830	840

revised depths within the V28–238 core are truly proportional to age. Hence, the (presumed correct) V28–238 $\delta^{18}O$ signal in Figure 2 can be used to test for disturbances and/or changes in sedimentation rates within *other* sediment cores. If one plots the depths at which particular $\delta^{18}O$ features were found within the V28–238 core on one axis of a graph, and the depths at which those same (presumed) features were found within another core on the other axis, the result is known as a Shaw diagram (Shaw, 1964; Prell et al., 1986). These plots often consist of a number of straight line segments, sometimes separated by "gaps" and/or exhibiting discontinuities in their respective slopes. Together these line segments make up the "line of correlation" (LOC). Since the depths (from the V28–238 core) on the vertical axis are assumed to be correct, the depths on the horizontal axis may be "corrected" by mapping them onto the vertical axis, thereby converting them to the V28–238 "reference" depth scale. Once this has been done, the (presumed correct) V28–238 linear age scale is applied to the data from the test core.

Figure 6 illustrates the basic concept. A set of clearly identifiable MIS events common to both the reference core and the test core is used to compare relative sedimentation rates in the two cores. Because there is some uncertainty in the depth of an MIS event, the events are represented by small rectangles, with the horizontal sides of the boxes indicating depth uncertainties in the test core and the vertical sides representing depth uncertainties in the reference core. These events are used to construct the line of correlation (LOC), with the LOC preferably passing through all the event boxes.

If one grants the assumptions that the $\delta^{18}O$ signal is globally synchronous *and* that the MIS events have been correctly identified in *both* cores, then the Shaw diagram can be used to compare relative sedimentation rates between the two cores. For instance, the time between events #1 and #2 in Figure 4 is Δt_1 in both cores, but during that time interval, a greater thickness of sediment was deposited in the reference core than in the test core, indicating that the sedimentation rate within the reference core was faster. However, during the time interval Δt_2, a greater amount of sediment was deposited in the test core than in the reference core, indicating that for that time interval, the test core had a faster sedimentation rate.

Hence, changes in the slope of the line of correlation indicate a change in relative sedimentation rate between the two cores. Since the sedimentation rate of the reference core (in this case, the V28–238 core) is assumed to be constant, changes in slope are assumed to be due to changes in sedimentation rate within the *test* core. One may correct for these presumed changes in sedimentation rate by transforming depths in the test core to depths in the reference core.

In their analysis, Prell et al. (1986) combined the RC11–120 and E49–18 $\delta^{18}O$ data into a single isotopic signal *before* comparing this composite signal to the V28–238 reference signal. However, this is *extremely* dubious, because their new depth scale had to be, to some degree, fictitious. This is because one particular isotopic feature, the MIS 6–5 boundary (or, in decimal notation, MIS Event 6.0), was located at one depth (440 cm) within the RC11–120 and at another depth (490 cm) in the E49–18 cores. Which depth, then, was plotted on the Shaw diagram? Based on their Figure 6, it appears that Prell et al. (1986, p. 151) used the RC11–120 depth scale. This means that depths within the E49–18 core had to somehow be converted to the RC11–120 depth scale before they constructed their Shaw diagram. But this would require them to make *assumptions* about the relative sedimentation rates for the RC11–120 and E49–18 cores. But the very purpose of a Shaw diagram is to *check* for changes in sedimentation rates, rather than to simply make assumptions about those rates! Would it not make more sense to actually *check* for relative changes in sedimentation rates in the two cores *separately*? Then, *after* such changes had been identified and corrected *separately* in both cores, the two data sets could be combined into a composite data set, if need be, on a common depth scale.

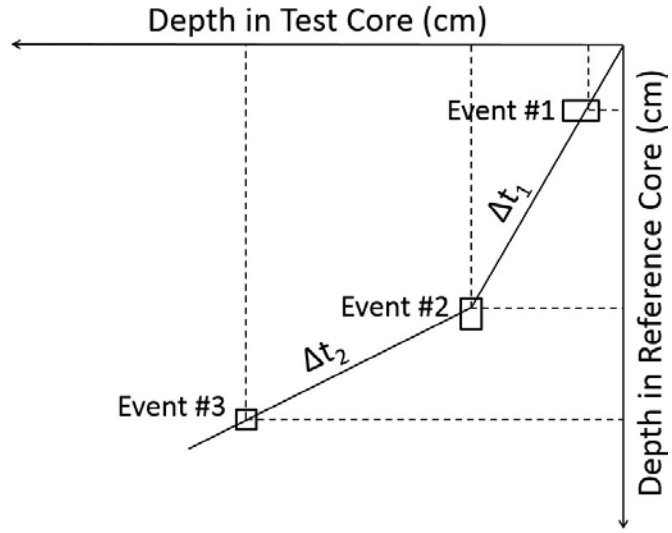

Figure 6. Conceptual illustration of a Shaw diagram, which compares the sedimentation rates within a test core to the (presumably constant) sedimentation rate in a "standard" core, such as V28–238. Each small box illustrates the depth uncertainties for a given isotopic event that has been identified in both the test and standard cores.

For this reason, I constructed *separate* Shaw diagrams for the RC11–120 and E49–18 cores. With a few exceptions, I used the isotopic features identified by Prell et al. (1986) and Howard and Prell (1992). However, because I used a newer version of the RC11–120 $\delta^{18}O$ data than did Howard and Prell (1992), my estimates for the locations of some isotopic events differed from theirs, particularly near the bottom of the RC11–120 core.

Isotopic Events Used in the Analysis

The isotopic events identified by Howard and Prell (1992) within the RC11–120 and E49–18 cores are listed in their Table 3 (pp. 88–90). Likewise, the depth range (maximum and minimum possible depths) associated with each isotopic event within the V28–238 core are found within Table 2 (pp. 144–148) in Prell et al. (1986). Note that the notation "SRC" in Prell et al.'s Table 2 refers to the V28–238 core (Prell et al., 1986, p. 148). Actually, "SRC" seems to be a typo; Prell et al. called V28–238 the standard reference *section* (p. 148); hence the acronym at the head of their Table 2 should really be "SRS," as it is in their Figure 1 caption. The most likely position of each V28–238 isotopic event was obtained by visual inspection of a graph of the V28–238 $\delta^{18}O$ data, plotted as a function of depth. These data were obtained from https://

Table 2. Marine isotope stage events in the RC11–120 deep-sea core that were used to place the RC11–120 data on the V28–238 depth/age scales.

MIS Event	RC11–120 Min. Depth (cm)	RC11–120 Most Likely Depth (cm)	RC11–120 Max Depth (cm)
1.1	10	20	30
2.0	30	45	55
2.2	60	70	85
3.3	175	185	195
4.0	205	215	220
4.2	220	225	235
5.0	245	250	270
5.1	255	290	300
5.5	410	420	435
6.0	435	440	455
6.6	595	600	605
7.0	605	620	635
7.1	630	645	655
7.3	670	675	695
7.4	700	722.5	740
7.5	740	760	775
8.0	775	785	790
8.2	790	805	820
8.3	815	830	840
8.4	835	840	855
8.5	855	865	895
8.6	865	895	905
9.0	900	910	920
9.1	920	927.5	940
9.2	940	950	950

doi.pangaea.de/10.1594/PANGAEA.51710?format=html#download . Generally, there was very good agreement between the depth ranges listed by Prell et al. (1986) and the online V28–238 $\delta^{18}O$ data.

Prell et al. (1986) further narrowed the possible depth ranges of MIS events by comparing data from more than a dozen sediment cores. They also listed these more restrictive depth ranges in their Table 2. However, I elected not to use these narrower depth ranges to construct my Shaw diagrams for a number of reasons. First, Prell et al. (1986) also used the RC11–120 and E49–18 data to obtain these narrower depth ranges. However, as noted earlier, they incorrectly "lumped" the RC11–120 and E49–18 data together (their p. 151), treating them as data obtained from a single core. Hence, this error could have biased their results. Attempting to correct for their mistake would require making separate Shaw diagrams for *all* the dozen or so sediment cores used in Prell et al.'s (1986) study, and then attempting to find an overall error range for each MIS event. Needless to say, this would be a *lot* of work, and it does not seem necessary; although the incorrect "lumping" of the RC11–120 and E49–18 data together may have biased the results somewhat, the Shaw diagrams one obtains using the narrower error ranges (their so-called SCU values) are very similar to those obtained otherwise (the SRC values from the V28–238 core). Hence, using the wider error ranges for the MIS events is unlikely to significantly alter the overall results, and given the effort required to obtain those narrower error ranges, it is likely not worth the effort. Second, it seems reasonable to avoid using data from a large number of cores, since doing so requires correct identification of the same (presumably global) MIS events in *all* the dozen or so cores. This greatly increases the possibility of incorrect identification of an MIS event or events.

Obtaining the RC11–120 Line of Correlation

The twenty-five isotopic features I used to place the RC11–120 data on the V28–238 depth scale are shown in Table 2. Most of these features came from the list provided by Howard and Prell (1992). However, none of their identified isotopic features were located within the uppermost 100 cm or so of the RC11–120 core. In order to obtain a better "spread" of data close to the origin, I also included the 1.1, 2.0, and 2.2 MIS features. These isotopic events seemed like reasonable additions to the list since they are fairly easy to identify. I also included the 8.6, 9.0, 9.1, and 9.2 MIS events. These four events were not included in Howard and Prell's list, but I included them to reduce uncertainty in the new depth scale at the bottom of the core. This was rather tricky, due to a gap of missing $\delta^{18}O$ data between 865 and 895 cm, but I estimated the locations of these four events to the best of my ability by assuming that the prominent $\delta^{18}O$ peak at 895 cm was MIS Event 8.6, and that the very bottom of the core (depth of 950 cm) was MIS Event 9.2. Note that this caused my depth assignments for MIS Events 8.4 and 8.5 to be noticeably different from the depths assigned by Howard and Prell. However, this seemed on balance to be more charitable to the Milankovitch theory, as my depth assignments were more consistent with those implied by Hays, Imbrie, and

Shackleton's (1976) Figure 2, and those assignments yielded results that were quite favorable to the theory.

I estimated the minimum and maximum possible depths for each RC11–120 isotopic features to the best of my ability, although this eventually turned out to be unnecessary. As a general rule, the "line of correlation" does not necessarily have to pass through the "centers" of all the data points; it only needs to fall within each of the error "boxes" for each point. Obviously, one needs to know the estimated errors in order to meet this requirement. However, I discovered through trial and error that better alignment results between the corresponding $\delta^{18}O$ troughs and peaks of the test and reference cores if one *does* force the line of correlation to pass through the "centers" of all the data points. This makes sense, because the "center" of each data point represents the "most likely" location of the corresponding isotopic event. Figure 7 shows the Shaw diagram for the RC11–120 and V28–238 $\delta^{18}O$ data, and Figure 8 shows the RC11–120 and V28–238 $\delta^{18}O$ data, both plotted on the V28–238 depth scale. There is very good alignment between the corresponding $\delta^{18}O$ features within the two cores, showing that the RC11–120 data has been successfully placed on the V28–238 depth scale.

Obtaining the E49–18 Line of Correlation

In a similar fashion, I plotted 25 isotopic events common to both the E49–18 and V28–238 cores (Figure 9). All but three of these isotopic events were included in Howard and Prell's (1992) E49–18 data from their Table 3. Their table excluded the MIS 6–5 and 8–7, and 12–11 stage boundaries (the MIS 6.0, 8.0, and 12.0 events), but it seemed reasonable to include them since these were age anchor points used in the Pacemaker analysis. Figures 3 and 4 show the locations of the identified isotopic events in the two cores, and Tables 1 and 3 provide these data in tabular form. Occasionally, the discrete nature of the data required me to place an event between two data points; for instance, the isotopic event 6.0 in E49–18 should be about halfway between the data points at 490 cm and 500 cm; hence, I reported this depth as 495 cm.

I chose to exclude from my analysis data from above MIS event 6.0 in the E49–18 core, as did the Pacemaker authors, mainly because use of those data points would have added

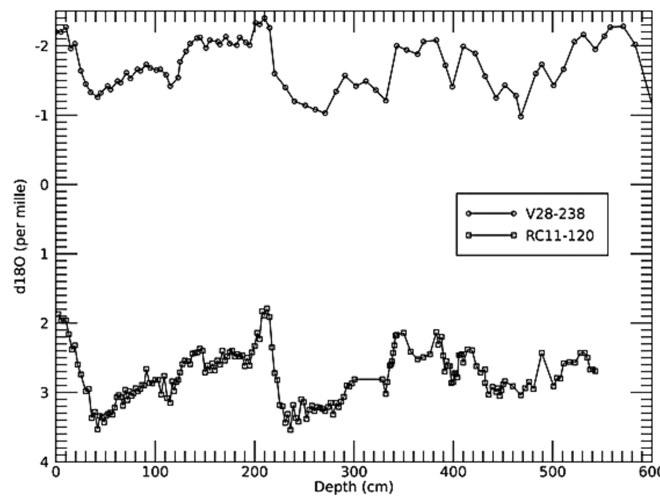

Figure 8. Comparison of the RC11–120 and V28–238 $\delta^{18}O$ signals, after the RC11–120 data were placed on the revised V28–238 depth scale.

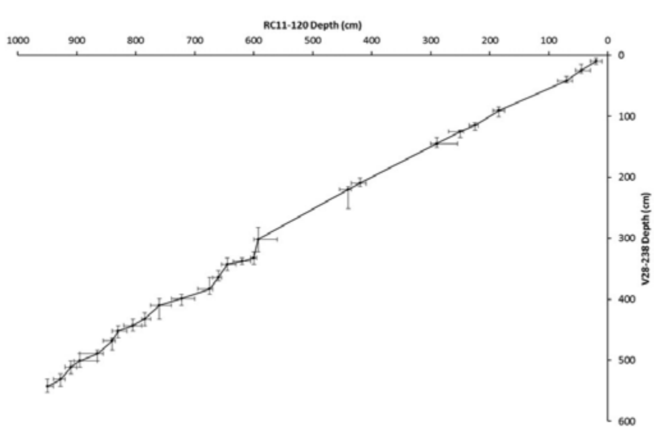

Figure 7. My Shaw diagram for the RC11–120 and V28–238 $\delta^{18}O$ data, constructed using the MIS events common to Tables 1 and 2.

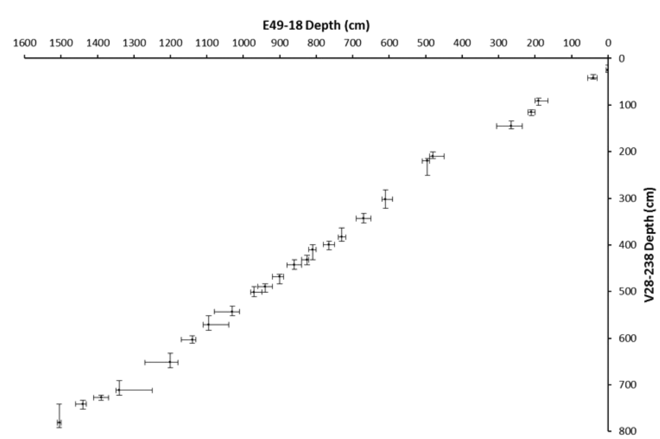

Figure 9. MIS events identified in both the E49–18 and V28–238 $\delta^{18}O$ data.

Table 3. Marine isotope stage events in the E49–18 deep-sea core that were used to place the E49–18 data on the V28–238 depth/age scales, as well as the six MIS events in the uppermost core section that were not used in this analysis.

MIS Event	E49–18 Min. Depth (cm)	E49–18 Most Likely Depth (cm)	E49–18 Max Depth (cm)
2.0	0	0	5
2.2	30	40	55
3.3	165	190	200
4.2	200	210	220
5.1	235	265	305
5.5	450	480	490
6.0	490	495	510
6.5	590	610	620
7.1	650	670	690
7.3	720	730	740
7.4	750	765	780
7.5	800	810	820
8.0	820	825	840
8.2	840	860	880
8.4	890	900	920
8.5	920	940	960
8.6	950	970	980
9.2	1010	1030	1080
9.3	1040	1095	1110
10.2	1130	1140	1170
11.1	1180	1200	1270
11.3	1250	1340	1350
12.0	1370	1390	1410
12.2	1430	1440	1460
13.0	1500	1505	1510

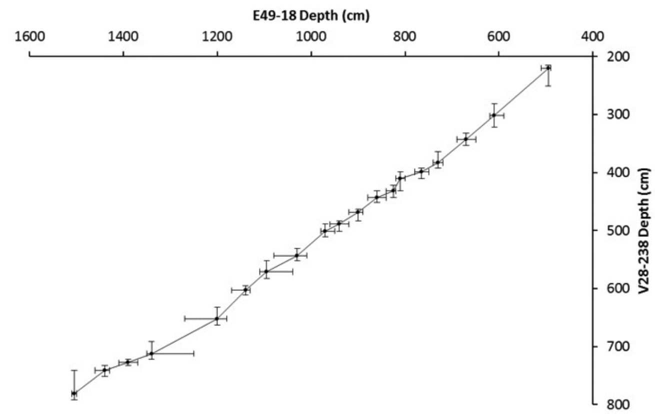

Figure 10. My Shaw diagram for the E49–18 δ¹⁸O data (bottom two-thirds only) and the V28–238 data, constructed using the MIS events common to Tables 1 and 3.

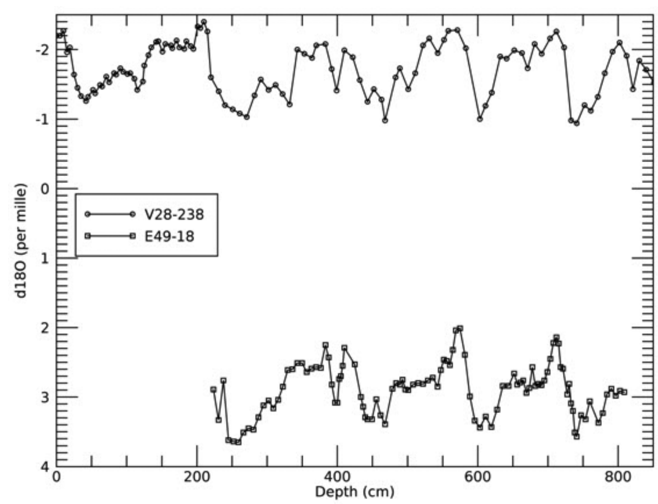

Figure 11. Comparison of the E49–18 and V28–238 δ¹⁸O signals, after the E49–18 data were placed on the revised V28–238 depth scale.

six additional line segments to my line of correlation (LOC). Even without using data from the top of the core, I still needed eighteen linear equations to place the E49–18 data on the V28–238 depth scale. And since the Pacemaker authors did not use the data from the uppermost part of the core, why should I have to, especially when doing so requires five additional linear equations? Figure 10 shows the Shaw diagram that was used to place the lower two-thirds of E49–18 data onto the V28–238 depth scale.

The E49–18 δ¹⁸O data are shown in Figure 11, along with the V28–238 data, after placing the E49–18 data on the V28–238 depth scale. Note that the alignment between corresponding isotopic features is pretty good but not as good as the alignment between the RC11–120 and E49–18 $\delta^{18}O$ features. One could improve this alignment by using additional MIS events in the Shaw diagram, but one runs the risk of misidentifying some of the additional isotopic features. Note also that the "spike" in the E49–18 $\delta^{18}O$ signal at about 240 cm in Figure 11 is not a mistake, even though it does not align with a comparable $\delta^{18}O$ feature in the V28–238 data; this feature is simply not present in the V28–238 $\delta^{18}O$ data.

After placing the RC11–120 and E49–18 data onto the V28–238 depth scale, I used the equation

$$\text{Age (ka)} = \frac{\text{depth (cm)}}{1170\ \text{cm}} \times 780\ \text{ka} \tag{2}$$

to transform the V28–238 depth scale into a timescale.

New Results

The original Pacemaker paper results were seen as strong evidence for Milankovitch climate forcing because the apparent lengths of the climate cycles (100, 42, and 23 ka) within the geological spectra were very close to those of calculated astronomical cycles (100, 41, and 23 ka). Of course, the revisions uniformitarian scientists themselves have made to the sediment core data have undone those original results. After making these revisions, but still using the methodologies of Shackleton and Opdyke (1973) and Hays, Imbrie, and Shackleton (1976), I redid the Pacemaker power spectrum calculations, the results of which are shown in Figures 12–20. The use of newer $\delta^{18}O$ data sets sometimes moved slightly the locations of the age control points used by the Pacemaker authors; the MIS 6.0 and 12.0 events in the E49–18 core are now located at 495 cm and 1390 cm, respectively, rather than 490 cm and 1405 cm, as originally reported in the Pacemaker paper.

Dashed double arrows within the figures indicate the approximate bandwidth for each spectrum, the meaning of which is discussed in Hebert (2016b, p. 138). In the Pacemaker paper, the original timescales for the RC11–120 and E49–18 cores were arguably too short to obtain a good estimate of the period of the eccentricity cycle, and the Pacemaker authors did not bother doing so. However, the newer timescales (358 ka for the RC11–120 core and 390 ka for the E49–18 core section) are long enough to attempt to obtain these estimates, so I did so.

Vertical lines in each figure indicate the frequencies/periods of the eccentricity, obliquity, and precession orbital cycles for the calculated time intervals. In some cases, a resulting astronomical peak was quite short relative to the other peaks, or there was considerable uncertainty in the estimate of the eccentricity frequency/period, as the eccentricity period was a large fraction of the time interval assigned to the core. In those cases, the vertical lines are dashed to indicate greater uncertainty in those astronomical frequencies/periods.

The new RC11–120 timescale extends from 0 ka to 362 ka. Because some of the RC11–120 data are missing from the very top of the core, I elected to set (after interpolation of the data) the timescale from 4 to 362 ka, so that all three data sets would "cover" the same time interval. I used an interpolated time-step $\Delta t = 2$ ka, which resulted in $n = 180$ interpolated data points. The power spectra in Figures 13 through 15 were obtained with the variable m set to 110 (see Hebert 2016b, pp. 135–138, for a discussion of the meaning of this parameter). Spectral analysis performed on the orbital variables over this same time interval (and using the same values of m and n) were used to obtain the expected Milankovitch periods/frequencies. I used Berger and Loutre's (1991) orbital data, accessed at https://doi.pangaea.de/10.1594/PANGAEA.56040?format=html#lcol0.ds1004521.

Before examining Figures 12–20, how do we determine if the (central) frequency f_0 of a climate peak agrees with the frequency obtained from the Milankovitch theory? As a first approximation, one can take the uncertainty in the (central) frequency f_0 of a spectral peak to be half the width of the peak, measured at half the peak's full height. In other words, the uncertainty in the frequency is the half-width at half maxima (HWHM). Hence, if a theoretically expected orbital frequency lies inside the full-width-at-half maxima (FWHM) of the spectral climate peak, then one can consider the central frequency f_0 of the climate peak to agree with the frequency of the astronomical peak (Muller and MacDonald, 2000, pp. 96–98).

Of course, there is also uncertainty in the orbital frequencies, so one might wonder if perhaps we should calculate error bars for the orbital spectra, too, and then check to see if the climate and orbital error bars overlap. However, this is not necessary. The uncertainty in a spectral frequency is mainly due the background noise (Muller and MacDonald, 2000, p. 96). Thus, the greater the height of a spectral peak compared to the background spectral power, the less the uncertainty in the estimate of the frequency (Muller and MacDonald, 2000, p. 98). Orbital spectra have extremely high signal-to-background ratios, so we can treat the uncertainties in the orbital frequencies as being negligible.

The RC11–120 SST results (Figure 12) are not particularly impressive. The expected precession frequencies do fall within the full-width-at-half-maxima (FWHM) for the F and G "peaks," although it is debatable whether these short "bumps" can really be called "peaks." The obliquity frequency just barely falls outside the FWHM of the C peak. However, the A peak is arguably consistent with Milankovitch expectations, as the second eccentricity frequency does fall within the FWHM of the A peak.

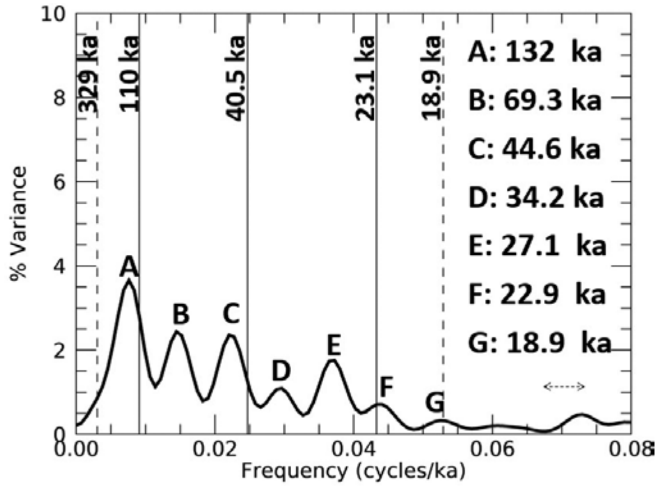

Figure 12. Revised RC11–120 SST power spectrum.

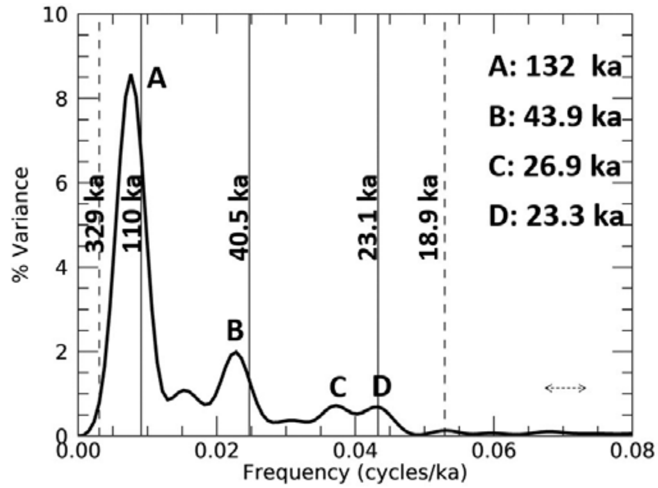

Figure 13. Revised RC11–120 δ¹⁸O power spectrum.

The RC11–120 δ¹⁸O spectral results (Figure 13) are in better agreement with Milankovitch expectations. The lower precession frequency (corresponding to 23.1 ka) falls within the FWHM of the D peak. However, no climate peak appears at the higher precession frequency (corresponding to 18.9 ka), but given the uncertainty and relatively low height of this precession peak, this may not be a problem. The obliquity frequency just falls on the rightmost edge of the FWHM for the B peak. The A peak is in agreement with the eccentricity frequency.

The RC11–120 % *C. davisiana* spectral results (Figure 14) are in considerably worse agreement with Milankovitch expectations. The A peak, according to the FWHM rule, is barely in agreement with Milankovitch expectations, but this is not the case for the B or C peaks.

The spectral results for data from the bottom two-thirds of the E49–18 core are in extremely poor agreement with Milankovitch expectations, as can be seen from Figures 15–17. After interpolation of the original data, the timescale extended from 149 to 539 ka (n = 131 data points, with Δt = 3.0 ka). The parameter m was set equal to 80. Again, the timescale of 539 ka – 149 ka = 390 ka is arguably long enough to calculate a theoretical value for the eccentricity frequency/period, so I did so. However, the width of this eccentricity peak was quite wide, so I used a dashed vertical line to indicate greater uncertainty in this particular frequency value. A "doublet" was again present in the precession power spectrum.

Given these equivocal results, construction of the PATCH composite data sets is not really justified, but for the sake of completeness I constructed them anyway. The new PATCH timescale (after interpolation) extended from 4 to 539 ka

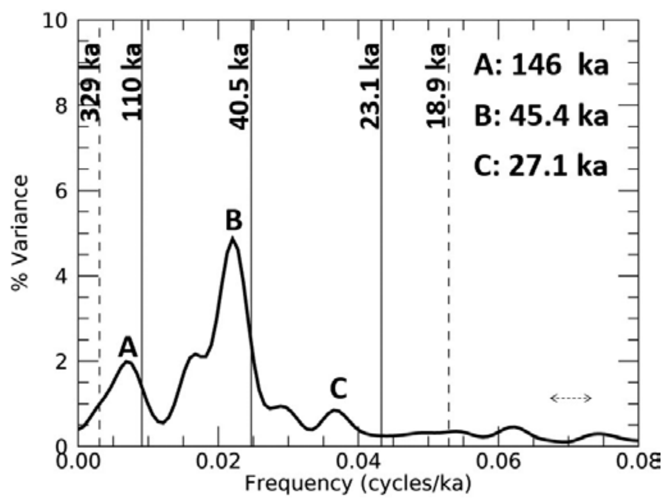

Figure 14. Revised RC11–120 % *C. davisiana* power spectrum.

(again, because some data were missing from the uppermost part of the RC11–120 core; the age scale was started at 4 ka). Because the radiocarbon age assignment of 9.4 (± 0.6) ka at a depth of 39 cm within the RC11–120 core contradicted the age assignment of 14.3 ka inferred from Eq. 2, this particular age control point was excluded from the analysis. Interpolation resulted in n = 215 data points with Δt = 2.5 ka. The parameter m was set equal to 95. Because a test of statistical significance implicitly assumes that the data are weakly stationary (Hu,

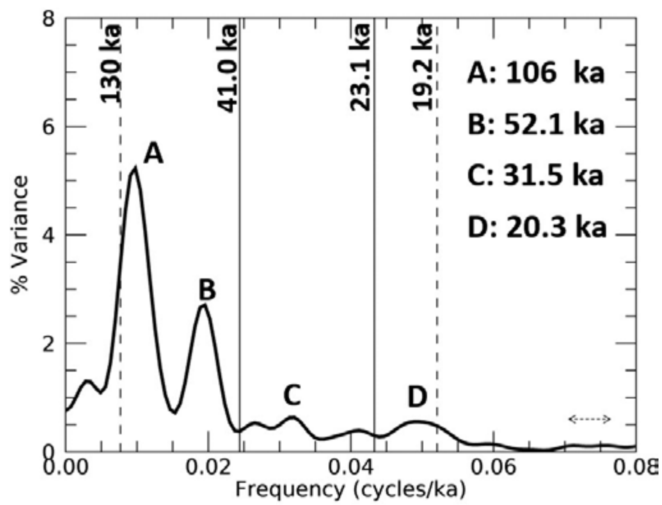

Figure 15. Revised E49–18 SST power spectrum.

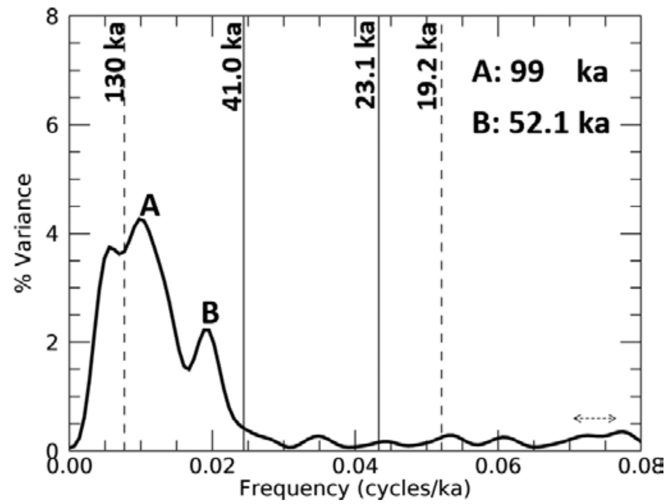

Figure 17. Revised E49–18 % *C. davisiana* power spectrum.

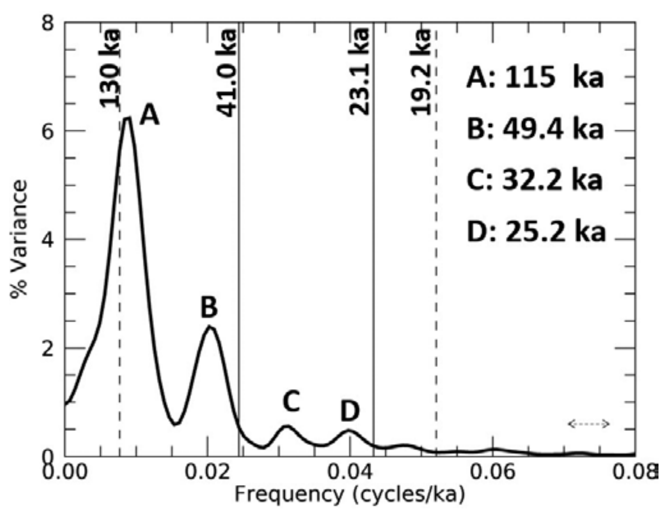

Figure 16. Revised E49–18 $\delta^{18}O$ power spectrum.

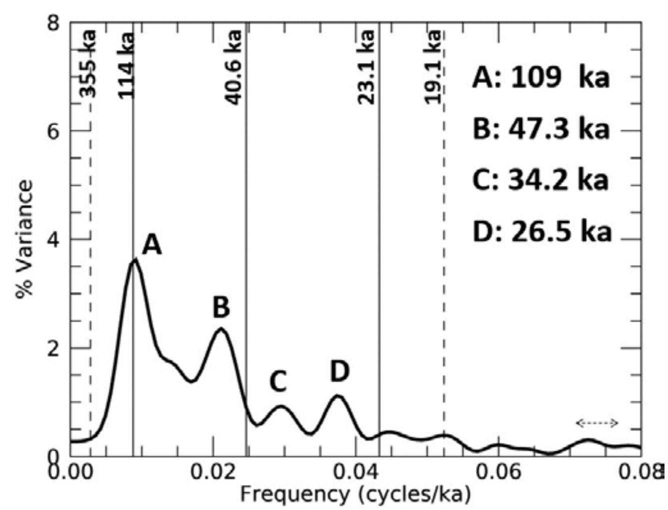

Figure 18. Revised PATCH SST power spectrum.

2006), I de-trended the RC11–120 and E49–18 data separately and normalized their standard deviations to 1.0 before combining them into a single data set (Hebert, 2016c, p. 245). Again, there was poor agreement between Milankovitch expectations and the actual results.

Some uniformitarian scientists claim that the age of the Brunhes-Matuyama magnetic reversal boundary is actually 790 ka (Berger et al., 1995; Karner et al., 2002; Muller and MacDonald 2000, p. 159). I used the lower age estimate of 780 ka in order to be charitable to the Milankovitch hypothesis. Using the higher age estimate will "stretch" the timescales for the sediment cores even further, potentially yielding results that are in even poorer agreement with the Milankovitch hypothesis!

Conclusion

Although Hebert (2016c) already demonstrated that the revision to the age of the Brunhes-Matuyama magnetic reversal

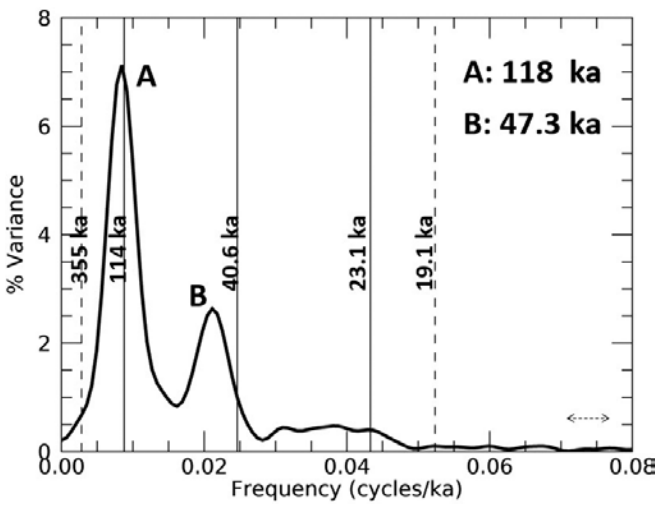

Figure 19. Revised PATCH δ18O power spectrum.

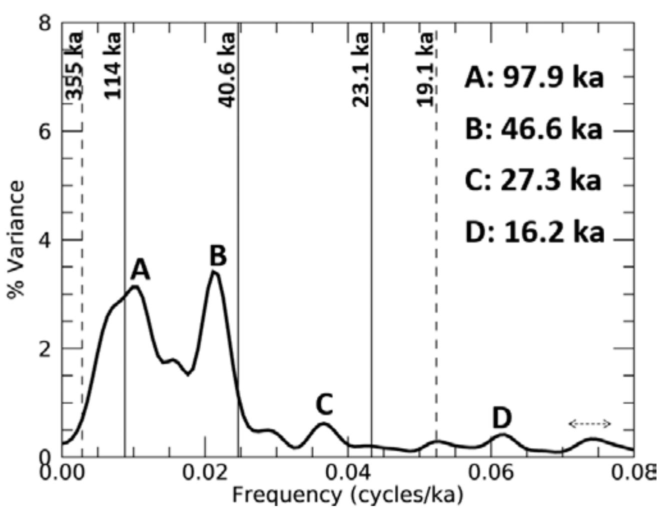

Figure 20. Revised PATCH % *C. davisiana* power spectrum.

boundary adversely affected the original Pacemaker results, there remained a slim but nonzero chance that these additional changes could collectively "cancel" each other out, yielding results that were again consistent with Milankovitch expectations. The results of this paper seem to have closed that potential loophole. Of course, uniformitarian scientists might "quibble" with these results on the grounds that they do not like my choice of MIS events that I used to construct my Shaw diagrams. Admittedly, this was the hardest part of this research project. The selection of the MIS events involved "judgment calls," and in some cases, it was genuinely difficult deciding whether or not an MIS event should be included in the Shaw diagrams, especially if that event was not included in the lists by Prell et al. (1986) and Howard and Prell (1992). However, I don't think "tinkering" with the choice of MIS events is likely to affect the results that much. I have done multiple trials using different combinations of MIS events, and none of them provided convincing evidence of the Milankovitch theory. If uniformitarian climatologists want to contest these results, they are certainly welcome to do the calculations for themselves, something that, candidly, they should have done more than 25 years ago!

It is obvious that the "Pacemaker" results cannot legitimately be used as an argument for Milankovitch climate forcing—even if uniformitarian paleoclimatologists are unwilling to publicly admit this!

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Conference Reports

CRS Conference Abstracts

July 27–29, 2017 • Greenville, SC

On July 27–29, 2017, the Creation Research Society held its seventh conference on the campus of Bob Jones University in Greenville, South Carolina. There were 130 Society members in attendance. One of the important aspects of these meetings is the opportunity to meet and engage in discussion with fellow creationists. Many of our members took advantage of this facet by attending the opening reception on the evening of July 27, where there were heavy refreshments. On the following evening, Dr. Ken Cumming gave the Henry M. Morris Memorial Lecture. The primary purpose of our meetings is to provide a venue where people can present preliminary research and gain valuable input from their peers as they continue to develop their work. We hope that much of the research presented at our meetings eventually will be published in the Creation Research Society Quarterly. *Since these are works in progress, we normally do not record the presentations. However, below are the abstracts of presentations at the 2017 meeting.*

Plenary Presentations:

Biblical Worldview Formation and the Work of Creationary Science

Bryan Smith

What exactly is a biblical worldview, and how does it relate to the work of creationary science? In this session we will discuss the term "worldview" and survey the basic elements of a biblical worldview. We will also apply a biblical worldview to the work of creationary science and to the role that creationary science should play in Christian education.

The eKINDS Project

Jean Lightner

People seem to have a natural fascination with the amazing diversity of life on earth. They naturally wonder about questions such as *Where did life come from? How are different plants and animals related?* and *How did all this variety arise?* The secular world provides a superficially compelling narrative about the natural history of life on earth. It begins by rejecting the Bible's history and postulating that all life arose by natural processes from a single common ancestor. When examined in detail, there are enormous problems with this view. Further, many who hold to the belief that the earth is billions of years old criticize biblical creationists, who recognize that life was created according to their kinds, that there was a global flood, and that biblical history limits the age of the earth to around 6,000 years. Some claim we believe in "hyper-evolution" or "evolution on steroids," implying that we cannot account for the diversity of life within the kinds of animals that exited the ark around 4500 years ago. The *eKINDS* (Examination of Kinds In Natural Diversification and Speciation) project was initiated to addresses specific questions remaining regarding the identity of created kinds, as well as their underlying design, which resulted in the amazing variety of creatures we observe today. The project was first announced in the Spring 2016 special genetic issue of the *Creation Research Society Quarterly* (*CRSQ*). Already, several researchers have submitted papers, which will be discussed in this presentation and will soon appear in the *CRSQ*.

Presentation Abstracts:

Professional Development Presentation—Invited Presentation

The "R" in CRS Stands for "Research": Creation Science Needs You!

Jean Lightner and Jake Hebert

Despite the enormous strides creation scientists have made since the 1961 publication of *The Genesis Flood*, the creation science movement is hindered by both limited funding and a small number of available researchers. This presentation, an update on a 2015 CRS conference talk, is an effort to encourage more CRS members to engage in research. If you have a passion for astronomy, geology, biology, or some other field, perhaps God is leading you to research it for His glory! Fortunately, there are many projects that could advance the cause of creation science which are inexpensive and/or could be undertaken by laypeople or in college courses emphasizing research. This presentation reviews previously suggested research projects and discusses new ones, including the following: reinterpretation of local geological settings within a Flood context, refutation of dubious claims that quantum mechanics allows a universe to be spontaneously created from nothing, updating a classic seafloor sediment argument for recent creation, and estimating the times of formation for the Greenland and Antarctic ice sheets in the Flood Ice Age model. Several topics related to the eKINDS project are discussed. Amateur astronomers might coordinate with professional creation astronomers via online telescope access. In some cases, all that is needed are textbooks, Internet access, paper and pencils, and a willingness to work hard to learn the subject matter! We have already found significant "leads" (including online references) for some of these projects, which we would be happy to share with other researchers.

Mirror Matter as a Sink for Radioisotope Decay

Eugene Chaffin

Evidence such as the Gallium Anomaly and the Reactor Antineutrino Anomaly may be interpreted in terms of the decay of protons and neutrons into the mirror particles originally proposed by the Russian physicist Okun. Recent evidence has difficulties explaining different results, from different methods, in measurements of the half-life of the free neutron. An interesting possibility is that the change from neutrons into mirror neutrons needs to be taken into account in order to do radioisotope dating. If the accelerated decay hypothesis of the RATE group is correct, the mirror decays would be relevant. This would appear as accelerated decay and help explain why radioisotope data can be consistent with a biblical timescale.

A Critical Analysis of Molecular Homology

Brian Vogt

Modern evolutionists rely heavily on multiple sequence alignments of molecular data to support claimed evolutionary relationships. The methods of data analysis upon which their conclusions are based are faulty in that they guarantee the production of phylogenetic trees even when the data consist of random gibberish. In spite of their limitations, such methods can be used productively for other purposes.

Is the Alboran Basin, Western Mediterranean, an Impact Crater?

Michael J. Oard

It is important to develop a comprehensive Flood model and to explain various regions within that model. With this goal in mind, the unique structural geology and geophysics of the Mediterranean Sea and southeast Europe have been examined within the developing impact/vertical tectonics (IVT) Flood model. From an extensive literature on the subject, secular scientists are greatly puzzled by the area. The most difficult aspect of the area is the half dozen basins, which have subsided and extended and are mostly surrounded by mountains formed by overthrusts pushed away from the basins.

The Alboran Sea Basin of the western Mediterranean Sea will be showcased. It represents a generally subsided basin with up to 10,000 meters of late Cenozoic sediments. It is surrounded on the north, west, and south sides by an arc of mountains that have been pushed in a radial direction away from the basin. On the north side are the Betic Mountains of southern Spain and on the south side are the Rif Mountains of Morocco. It takes a tremendous, unique force to push rock dozens of kilometers up and out of a basin. This unique structural geology is mostly consistent with an impact crater with a diameter about 200 kilometers. Secular scientists automatically apply plate tectonics to the problem with little success. This research can be extended to other unique basins in the region and possibly to other areas of the world.

The Human Y Chromosome, According to Genesis

Robert Carter

The 1000 Genomes Project sequenced 1,233 males from multiple populations worldwide. This makes it possible for the first time to comprehensively examine the historical changes in the Y chromosome, starting with people alive today and working backward in time to the ancestral sequence of each major group. After calculating the putative ancestral ("founder") sequence for each haplogroup, this can be compared to the living descendants of that founder. Individuals within haplogroups consistently displayed a near clock-like accumulation of mutations. Yet different haplogroups had statistically significant differences in rates of divergence from their respective ancestors. This brings evolutionary models of Y-chromosome history, based as they are on a molecular clock, into question. The results strongly suggest that modern Y-chromosome sequences derive from an original population that was very small and then grew rapidly, as required by Genesis. The striking star-like phylogeny and multiple near-polytomies, where none would be expected in large, deep-time evolutionary populations, support this. Also, modern human males descend from three closely related ancestral individuals. This is suggestive, but not conclusively, of Shem, Ham, and Japheth, because several possible placements for Noah (the evolutionary "Y-Chromosome Adam") exist. There are multiple aspects of the Y-chromosome tree that validate the biblical account, but we do need to be cautious about drawing hasty conclusions as several historical possibilities exist.

Darwin's "Abominable Mystery" and the Grand Staircase Fossil Record

Warren H. Johns

The greatest exhibit of a worldwide Deluge in any one location is the Grand Canyon of Arizona and its surrounding area. The canyon itself with some 5,000 feet of fossil-bearing rock is interpreted as being entirely the product of water. North and east of the Grand Canyon are a series of rock formations that from the surface appear to be giant stairsteps, known as the "Grand Staircase." These add another 4,000 feet of fossil-bearing sediment that are said to overlie the highest rock formation in the Grand Canyon—the Kaibab Limestone (interpreted as Permian).

A problem for both evolutionists and creationists is the non-appearance of flowering plants as fossils until near the top of the Grand Staircase in the Dakota Formation and in the Cedar Mountain Formation at the base of the Dakota (both Upper Cretaceous). No wood or leaves of angiosperms (flowering plants) are to be found in strata below what are conventionally dated as "Upper Cretaceous" in the Grand Staircase. The Morrison Formation, which is Jurassic and is thus below the Dakota Sandstone, has an abundance of plant fossils and dinosaur remains, but no angiosperms. Below the formation is the Triassic Chinle Formation with its petrified logs arranged in what are called "petrified forests." But no angiosperm logs are found there. Darwin's "abominable mystery" is the acknowledged fact that angiosperms first appear abruptly in Cretaceous rocks around the world without any identifiable precursors. This fact alone weighs heavily in favor of a creationist model as opposed to an evolutionary model for the origin of flowering plants.

Genesis 1 is very precise when it describes the creation of trees and plants with fruits containing seeds within the fruits (Gen. 1:11–12, 29), which is the technical definition of "angiosperm." Moreover, these plants are described as occupying the "face of all the earth," which is a technical expression for universality as in the Flood narrative (Gen. 1:29; cf. 6:7; 7:3, 4, 23; 8:8, 9, 13). This paper will address the issue of why there are no angiosperms in pre-Dakota formations that clearly have land plants, such as the Chinle and Morrison formations. It will offer a range of possible solutions from a creationist standpoint.

Reading the History of Civilization Through Comparative Y-Chromosome Analyses

Nathaniel T. Jeanson and Robert C. Carter

Preliminary creationist work on autosomes and on mitochondrial DNA suggests that a molecular clock exists and that this clock ticks off time consistent with the young-earth timescale. However, whether the clock ticks at the same rate in each lineage has not yet been established— particularly for some of the deeper African groups. Regardless, the fact of a clock implies that the history of civilization can be read off of comparative DNA analyses. Among mitochondrial DNA comparisons, high levels of statistical noise have hampered attempts to test this hypothesis. In contrast, the low level of statistical noise among Y-chromosome comparisons suggest a ready means to test it. We have begun exploring the Y chromosome for signatures of recent historical events, including the trans-Atlantic slave trade and European colonialism, and we will be presenting the latest results of these investigations.

The State of Dark Matter and Why It Matters

Mary Beth De Repentigny

There are two main reasons for scientists to invoke dark matter. The first is to solve the astronomical problem of the rotation curves of spiral galaxies that do not line up with Newtonian physics. The second is to solve the cosmological problem that gravitational constraints present to big bang nucleosynthesis as well as to the smooth initial condition observed in the cosmic microwave background radiation.

The search for dark matter matters to creationists, first, because we love truth and seek to understand the order in God's creation. We know that the heavens declare the glory of God. We thus hate to see the majority of scientists today trying to veil God's glory in the heavens with the unbiblical evolutionary worldview, which clouds their judgment of the observed phenomena in outer space. As creationists, we recognize that the subject of dark matter is being used to hide fine-tuning in the universe and to explain evolutionary concepts such as how the dinosaurs became extinct.

One major candidate for dark matter has been the theoretical supersymmetric particles. The search for these particles at the Large Hadron Collider has recently been acknowledged to have turned up negative. The search for dark matter from deep underground to outer space has likewise been fruitless.

In considering alternatives to the dark matter conundrum, the solution to the cosmological questions may need to be separate and different from the answer to the astronomical inconsistencies. We will look at a few of the best contenders.

Mutations: Nature's Path to Extinction, not Evolutionary Advancement

Charles McCombs

Mendel's Accountant is a computer program developed to provide a biologically realistic forward-time numerical simulation of mutation accumulation and to show the effect of this accumulation on the fitness of a population. Using the Mendel's Accountant program, several scenarios were studied while varying the basic parameters one at a time. A comparative analysis of the population fitness values for each scenario obtained by varying the mutations and population size, as well as an advanced study on population bottlenecks, showed many devastating results for evolutionists. More importantly, a computer program established from parameters obtained from the scientific literature and data that is favorable to evolutionistic thinking provided results consistent only with the Bible.

The "Pacemaker of the Ice Ages": Closing Loopholes in Its Refutation

Leo (Jake) Hebert III

The authors of the 1976 "Pacemaker of the Ice Ages" paper computed power spectra using data from two deep-sea Indian Ocean sediment cores. The resulting prominent spectral peaks corresponded to periods of predicted Milankovitch orbital cycles and were largely responsible for today's widespread acceptance of astronomical climate forcing. Since Milankovitch theory assumes "millions of years," the Pacemaker paper has also become a classic argument for an old earth. In the interim, uniformitarians have themselves called into question most of the assumptions that were implicit in the Pacemaker analysis. They have revised upward the age of the Brunhes-Matuyama (B-M) magnetic reversal (which played an important role in the analysis) by 80,000 years. They have also published newer (generally higher resolution) versions of the core data, and they have argued for possible disturbances (changes in sedimentation rates, core breaks, etc.) in the sediment cores that were used in the analysis. Last year I presented preliminary power spectrum results after taking into account the revision to the age of the B-M reversal boundary. Those final published results greatly weakened the original argument for Milankovitch climate forcing. For the sake of completeness, I am redoing the calculations using the most recent versions of the available core data and taking into account all known changes to the relevant timescales, including those due to alleged core disturbances. Preliminary results from these new calculations are presented. Given the importance of the Milankovitch theory to uniformitarian geochronology, negative results would be potentially devastating to uniformitarian dating schemes.

Insular Dwarfing: Another Mechanism of Continuous Environmental Tracking

Randy J. Guliuzza

Island colonization may be associated with remarkable populations of gigantic or dwarf forms from mainland conspecifics. These "insular" dwarfs are entirely scaled-down versions (often less than 20%) of non-dwarf size and are widely observed (e.g., dinosaurs, elephants, birds, lizards, deer, canines, and felids). Genetic comparisons usually show small differences between the morphologies. Keoh et al (2004) in studying Australian tiger snakes observed that where island giants, dwarfs, and mainland tiger snakes all occur, the maximum genetic divergence is only 0.38% and conclude, "Our data provide strong evidence for rapid and repeated morphological divergence in the wild due to similar selective pressures acting in different directions." Evolutionists readily embrace explanations based on a fortuitous stacking of coincidences. But when creationists see widespread, similar types of changes, described as rapid, repeatable, and flowing from little genetic change, then these should be recognized as design-distinctive expectations that are clues to look for internally regulated mechanisms that detect changed conditions, process data with condition-consequence logic, and express suitable traits. Those expectations fit the creationist model continuous environmental tracking (CET). This design-based model of adaptation emphasizes organisms as active, problem-solving entities. Insular dwarfing is shown to fit CET's two basic premises: (1) multiple innate mechanisms self-adjust organisms to produce change-suitable solutions that precede—are not due to—changing conditions; and (2) organisms actively track changing conditions—are not "pressured" by them—while driving themselves through time to fill new niches, not necessarily to survive.

Evidence that the Precambrian Geologic Era was from the Fall to the Flood

D. Russell Humphreys

Creationists are divided over the time in biblical history that Precambrian rocks (radioisotope ages from 0.54 Ga up to 4.56 Ga) were formed. Some put it during Creation Week and others near the beginning of the year of the Genesis Flood. Here I call attention to evidence from radioisotope-dated Precambrian rocks that were magnetized by the moon's former magnetic field. The evidence strongly implies that while the moon's magnetic field was decaying with a roughly one-century half-life (determined from seismic evidence about the moon's core), about 4.0 Ga worth of accelerated nuclear decay (along with accelerated cooling) was occurring, from shortly after Creation (and the Fall) until the Genesis Flood 1656 years later (according to Scripture). This would put the late heavy bombardment that made most lunar craters (ages 3.9 to 4.1 Ga) less than two centuries after Creation. Evidence suggests that the Precambrian occurred simultaneously on the moon and on the earth. The main objections to that idea are that the biosphere would suffer too much: (1) radioactivity, (2) geologic activity, and (3) meteor bombardment. Here I suggest one possible scenario as a solution. It has the first two activities occurring many kilometers beneath the surface, safely away from the biosphere, and it has most of the meteors being ice balls that broke up in the atmosphere before hitting the surface. I offer both scientific and biblical evidence for the scenario.

A Computerized Genetic Algorithm of Single-Point Mutations to the Exon of the Beta Subunit of Hemoglobin A

Marshall Jordan

Evolutionary theory requires random mutations to DNA as a source of new biologic information. The known SNP mutations to Hemoglobin show that improvements to protein function are exceedingly rare, while the negative effects are readily apparent. The failure of random mutations to provide functional biologic information supports the biblical record that God created the DNA/protein information system upon which all life is based.

In a computer model of random changes to the exon for the beta subunit (HBB) of Hemoglobin A, the amino acid changes are grouped according to chemical properties and assigned a positive, neutral or negative affect on protein function. The number 6 amino acid is found to mutate at a rate of 0.0076 for SNPs to the HBB DNA exon. Of these, most are negative, and there are twice as many lethal or negative mutations as neutral or positive mutations. The sickle cell mutation occurs at a rate of 0.107x10^-7 for the entire genome, or one sickle cell mutation per 100 million births. Since positive mutations are vastly outnumbered by negative, this algorithm suggests that evolution by random mutation is impossible.

In Psalm 14:1, the Lord says, "The fool hath said in his heart, There is no God." It is foolish to believe that natural processes produced life on earth rather than the creative power of God. The more we understand of the DNA/ protein information system, the more foolish and intellectually bankrupt becomes the notion that random mutations can improve anything that God has done.

The Material Analogy of the Heavens Revealed in Scripture and its Implication to Cosmology and Fundamental Physics

Tichomir Tenev, Mark Horstemeyer, and Denver Seely

We present a material model of the heavens consistent with Scripture and scientific theory that can be the basis for a biblical cosmology. We relate the Scripture passages suggesting material heavens to the cosmic fabric model of spacetime by Tenev and Horstemeyer (2016), from which the equations of general relativity could be derived. The pattern of the tabernacle suggests God's design of the heavens and reveals their structure at multiple length scales. We analyze the relationship between the various length scales using the techniques outlined by Horstemeyer (2012) and discuss the implications of the proposed model and how it fits with current cosmological observations.

The emerging view of the heavens is of a highly organized, multi-scale hierarchical system literally screaming of design at each length scale (Psalm 19). While agreeing with Scripture and observations, this view repudiates the cosmological principle (CP), which is the basis for the big bang model and has the explicit assumption that the universe is undesigned. The rejection of CP's simplifying assumptions, however, leaves behind mathematical complexities, which a biblical cosmological model must overcome. We envision that the proposed material model of the heavens will offer a way to address such complexities similarly to how solid mechanics and mechanical engineering deal with complex body shapes and structures.

Baraminology Classification Based on Gene Content Similarity Measurement

Matthew Cserhati

A recently developed genomics-based baraminology method has been developed which measures the gene content similarity (the Jaccard Coefficient Value, or JCV) between species and classifies them into individual baramins. The method is based on the creationist assumption that genes are conserved across genomes within a baramin and represent functional units. Species from the same baramin should contain many common genes and thus have a high JCV.

This method has been further developed and estimates baramins based also on k-means clustering. The method also calculates two parameters, the pan-genome quotient (PGQ) and the completeness index (CI), which describe how much genome erosion via gene loss has occurred in the pan-genome of the archebaramin since the Fall. The PGQ measures the intersect/union of all genes in all species in a given baramin, while the CI measures the number of genes in all species in the baramin divided by the number of species in the baramin times the size of the union.

This method has been heretofore used in the analysis of bacteria (NCLDVs), archaea, and insects. The method has also been tested on a data set covering 26 fungal species. The algorithm predicted three baramins, with seven species from Pezizomycotina, three from Agaro/Ustilagomycotina, and 15 from Saccharomycotina.

Based on our experience, there is no single JCV cutoff by which we can assign species into the same or different baramins. For example, bacterial baramins may have a rather low mean JCV due to HGT. In general, gene content baraminology studies depend on the biology of the organisms under study. With more and more protein data becoming available, the JCV method can hopefully be used in many future baraminology studies.

The Bible: The Foundation for All Science

Richard Overman

The Bible says that the laws of physics and all other natural laws were created by God's spoken word. Nine times in Genesis 1 the Bible says, "and God said." Everything that was created was through His word. The Bible also says that God's Word is truth (John 17:17). Indeed, "truth is the foundation of science. If you trash the truth, there is no science" (Damadian, 2015). True science, then, is the study of the laws of nature as God originally designed them. "All truth belongs to God, no matter who happens to discover or proclaim it. From the physical laws of nature and the universe to truth about God in creation to spiritual truth revealed by Scripture, it all originates in an eternal God and Creator of us all" (Damadian, 2015). This paper explores a central theme of my doctoral dissertation, which is that the Bible is the foundation for ALL science and no scientific field can exist without the Bible. Science can be divided into three major groups: physical sciences, biological sciences, and social sciences. Every field of scientific study is a subset of one of these three groups. By showing that the Bible lays the foundation for each of these three groups, the Bible lays the foundation for every field of scientific study. The paper outlines the first eleven chapters of Genesis to correlate the Bible with the foundation for each of the science disciplines.

Rapid, Repeatable, and Predictable Adaptations Fit Post-Creation and Flood Creationist Theory

Randy J. Guliuzza

Discovering mechanisms underlying changing traits of population members is key to explaining natural diversification and speciation. Three recent studies illustrate targeted, rapid, repetitive, and essentially "predictable" species-level changes in traits. Marques et al. (2017) found rapid changes in amino acid had "tuned" an opsin molecule enabling stickleback fish to fill a "darkwater" niche. The exact changes were found in two other species of spiny-fin fish in darkwater conditions. Marques et al. conclude, "The emerging view in evolutionary biology is that mechanisms underlying adaptive evolution are often highly repeatable and thus may be predictable." Maruyama and Parker (2017) uncovered radical morphological changes in parasitic rove beetles to mimic their army ant host that independently recurs in different populations "following a predictable phenotypic trajectory." Esquerre and Keogh (2016) observed that unrelated pythons and boas will both express five distinct, yet nearly identical, morphologies "when they occupy equivalent ecological niches." Rapid, repetitive, and predictable are not associated with any explanation counting on genetic solutions "shot gunned" (a few work; most don't) at environmental problems. But these findings align with expectations of continuous environmental tracking (CET) presented at the CRS in 2016. CET is a design-based model of adaptation emphasizing organisms as active, problem-solving entities. CET expects organisms to have various regulated mechanisms that detect changing conditions, process data using condition-consequence logic, and then express fitting traits. CET expects "targeted" responses that can be rapid, suitably repeatable, and potentially reversible—which fits the rapid spread of today's new species from small numbers preserved on the ark.

Proposal of Step-Down Saltation for Intra-baraminic Diversification

Kurt P. Wise

High present species diversity in land baramins requires 2–3 orders of magnitude increase in species diversity since the Flood. The short timescale of the creation model requires this diversification to occur in <300 years. The catastrophic deposition of Cenozoic sediment required by a basal Paleogene Flood/post-Flood boundary suggests high preservation rates in post-Flood sediments. Thus, the lack of interspecific stratomorphic intermediates indicates post-Flood speciation events were saltational.

I propose the morphological change in each saltational event was designed to begin large and decrease toward the present (called "step-down saltational intrabaraminic diversification," or SDSID). SDSID is shown to (1) quickly restore intrabaraminic disparity, (2) generate intrabaraminic nested hierarchy, (3) explain Paleogene and Neogene disparity-before-diversity data, (4) explain "bushy" Cenozoic evolutionary trees, (5) allow organisms to track exponentially decreasing rates of environmental change following the Flood, and (6) generate the regular geometric and arcuate patterns seen in ANOPA and MDS.

Early branches of mtDNA diversification trees are shown to be the origin of taxa *above* the level of species. Thus, mtDNA data does *not* show a constant speciation rate but rather a constant *taxon* origination rate, where the taxonomic level decreases through time (as expected in SDSID).

Equid diversification (from the equid ANOPA of Cavanaugh et al., 2003, and the equid fossil record) demonstrates decreasing morphological change, both in real time and with the number of transitions since the hypothetical ark ancestor (as expected in SDSID).

Post-Flood Migration of Ectothermic Tortoises to the Americas: A Terrestrial Route

Timothy McCollister

Ectothermic tortoises may have been capable of migrating to the Americas through the Bering Strait land bridge in the immediate post-Flood environment by living and reproducing in the coastal isotherms presented in the global Flood Ice-Age model.

Though other migratory methods, such as oceanic dispersal and human assistance, have been used throughout the earth's history, a terrestrial route would have provided the most natural means for these reptiles to utilize in the immediate post-Flood world. Both oceanic dispersal and human assistance have problems that likely would have prevented tortoises from utilizing either of these modes of migration in order to explain their past and present existences in the Americas, such as severe oceanic conditions, log limitations, swimming capabilities, and how humans over exploited many tortoise species into extinction.

But in order to determine the window of opportunity, one must determine the tortoises' minimum thermal requirements and the temperatures that would have existed in the coastal isotherms of the global Flood Ice-Age model. All reptiles are ectothermic; they rely heavily on external heating sources such as convection, conduction, and radiation in order to maintain their desired body temperatures. When this understanding is partnered with the global Flood Ice-Age model, the coastal isotherms would have existed in the immediate post-Flood environment, and they would have allowed the migration of reptiles to occur throughout the globe, regardless of latitudinal positioning, for nearly a century.

Near-Impact Events Relevant to the Young-Earth Paradigm

Denver Seely, Andrew L. Bowman, Noah Cho, and Mark F. Horstemeyer

Evidence of impacts are abundant in the solar system. In developing the creation model and history of the Flood, consideration should be given to the relevance and timing of such impacts and interactions between celestial bodies that lead to near impacts. The standard secular model acknowledges that impacts and disruptions have occurred but relegate them to the far distant past. In the secular literature, various n-body simulations attempt to evolve the solar system through time. These simulations take into account the perturbing influence of near passages and allow for dissipation of orbital energy in the interaction but do not provide detail on the local nature or distribution of the dissipation. Observations from a growing number of exploratory satellite missions suggest that many natural satellites show a high heat flow anomaly. We suggest that these satellites have experienced recent orbital disruptions capable of accounting for the high anomalous heat flow. Finite element models of planetary scale interaction are under development to match a range of solar system scenarios. The material models implemented are capable of capturing dissipation effects within the body of a planet or satellite. The model is applied to a deformable body captive in a stable tidal lock orbit subject to a disrupting gravitational perturbation. We present preliminary simulations on a subset of orbital interactions of interest and solicit input from the community on where such tools might best be applied to advance the common understanding of events during the Creation week and the great Flood.

Is Evidence of the Global Flood Being Misinterpreted as Ice Age?

Carla Estell

Because the Ice Age is a step in the evolutionary ladder and is used today to push evolutionary thought (the Ice Age movies for children), creationists must be careful not to misinterpret evidence of the global Flood as support of the Ice Age. We must ask, "Is there any geological evidence for an ice age that could not also be explained in the light of the global Flood?" Mt. St. Helens offers observable proof of the geological sculpturing power of mud and water.

Pagan society does not have a global Flood as a carving agent, so it needs ice; nor does it have flowing water as a silt-carrying agent, so it needs wind. We need to be careful not to assume ice instead of water just because of geological location. And we also need to be asking, "If the fossils of zebras, camels, mammoths, hippos, etc. are from the Ice Age, then where are the fossils of the mammals that died in the global Flood?" If we are not careful, we may be dismissing some of our best Flood evidences by clinging to a theory that is neither biblically based nor historically supported.

Variable Neutrino Mass, Supernovae, and Accelerated Decay

Eugene F. Chaffin

The antineutrino flux from radioactive uranium, thorium, potassium-40, etc. on the earth's surface is of the order of 10^6 antineutrinos per square centimeter per second. The flux of neutrinos from the sun is four orders of magnitude larger. Larger than that would be the cosmic background of neutrinos and the possibility of a nearby supernova. Recent physics literature contains theories in which the neutrino mass is coupled to the neutrino density via a so-called acceleron field. This acceleron field is hypothesized to resemble the Higgs field and to change strength due to neutrino couplings and variation in neutrino density. The radiocarbon evidence for a nearby supernova is discussed and related to the possibility that such a supernova showered the earth at the time of Noah's Flood. This would contribute to accelerated decay and provide evidence that radioisotope data can be consistent with a biblical timescale.

Advancement of Material Model for Earth's Mantle Deformation Supporting Catastrophic Plate Tectonics During the Genesis Flood

Noah Cho, Mark F. Horstemeyer, and John Baumgardner

The deformational behavior of rock under stress, that is, its rheology, plays a central role in the internal dynamics of the earth. Rock deformation is determined by the thermomechanical properties (e.g., elasticity, plasticity, damage, etc.) of the minerals comprising the rock. The thermomechanical properties, in turn, are influenced profoundly by microstructural features such as grain size, phase transformations, dislocations, and crystallographic orientations. Many of the microstructural features can result in orders-of-magnitude reductions in rock strength, such that the mantle as a whole deforms in a catastrophic manner. Because mantle rocks are polycrystalline and microstructural properties of individual constituent minerals play important roles, a comprehensive deformation model capable of handling all these microstructural variations is needed to explore with scientific rigor the weakening mechanisms that contributed to the runaway dynamics and catastrophic plate tectonics of the Genesis Flood. In this study, we present advancements of material model (using internal state variable plasticity-damage model) simulating the deformational behaviors of the mantle in the frame of catastrophic plate tectonics during the Genesis Flood. The model uses experimental mineral data from the literature for the important mantle minerals, in the framework of the TERRA finite element code, to explore—including multiple mineral phases simultaneously—the effects of grain size, creep, texture, stress state, and damage on overall rock strength under conditions that existed in the mantle during the Genesis Flood. This study sheds light on crucial new understanding on the strength-reducing mechanisms that allowed the global Flood cataclysm to unfold as it did.

No Deliberate Disposal for *Homo naledi* Based on Geological Analysis

Timothy L. Clarey

Homo naledi is the most recent claim of a human ancestor. Since its announcement, the question of what the bones truly represent has been under constant scrutiny. The discovering scientists have also proposed that the bones were deliberately placed there over an extended period of time by living *Homo naledi* in some sort of burial ritual.

This paper reviews the detailed geological report of the cave site. A simplified interpretation is proposed after recognizing that two of the sedimentary units described in the report were likely deposited simultaneously. The bone bed can then be explained by a single episode of flooding, causing suspended sediments and the *H. naledi* remains to drain downward into the Dinaledi Chamber as one continuous event.

Any attempt to humanize these bones by claiming *Homo naledi* had behavior like humans is unfounded. The emplacement of *H. naledi* in the Dinaledi Chamber is likely nothing more than an example of a single, catastrophic event, revealing very little about past behavior. In addition, taking away the deliberate disposal of *H.naledi* allows the deposition of the bone bed to be viewed as a one-time event that fits the Creation model for the post-Flood world. The scattering of the bones within only the upper 20 cm of the cave floor suggests the emplacement of the bones occurred recently, possibly during the Ice Age, when water levels and climate fluctuations would have been more sporadic, suggesting the bones are about 4000 years old.

Characterization of Partially Petrified Wood from an Eocene Deposit in Mississippi

Nayeon Lee, Sungkwang Mun, M. F. Horstemeyer, Stephen J. Horstemeyer, and David J. Lang

This study experimentally investigates undecomposed wood and petrified wood from the same piece of material collected at the Red Hills lignite mine in Mississippi, USA, to verify the young earth. The Mississippi Embayment was reportedly created during the Paleocene-Eocene geological age in the Cenozoic period. In terms of the Flood geology, that lignite would have accumulated during the early runoff phase of the Flood. "Real wood" can continue to exist only during the process of petrification when rapid water inundation excludes oxygen. This could come from a global Flood or occur during locally heavy rains if the land is relatively flat near rivers or oceans during the post-Flood. Although there are some reports about an inundation process for petrification, there is no study to cope with the time conflict between undecomposed wood and petrified wood when there is coexistence. Our study focuses on the Genesis account of the catastrophic geological event (Genesis 7–8) to resolve this problem. Our work consists of DNA extraction from the undecomposed wood to identify the original wood, and material characterization by using microstructural observations, chemical composition analysis, and hardness testing. 70 ng of DNA was extracted, while it is reported that it is impossible to extract DNA from a sample that is older than one million years old. Microscopic images show that the petrified wood portion has recognizable plant structures. Chemical composition analysis verified that the undecomposed wood portion consists of carbon and the petrified wood portion consists of silicate.

Observational Evidence for Dark Energy

Robert Hill

Dark energy is an active topic of research by astronomers and physicists today. However, many creationists doubt the existence of dark energy. The reason for this skepticism is the common linkage between the big bang theory and dark energy in many publications and talks. Thus, the claim is that dark energy was a concept invented to fix the big bang model. This talk examines this claim. A literature review was performed, and the observational evidence in favor of dark energy was examined. It has been concluded that dark energy was not invented to fix the big bang model. Astronomers were driven to the concept of dark energy by observational evidence. The observational evidence for dark energy will be reviewed. The implications that dark energy has for creationist models will also be discussed.

Magnetic Orbital Decay of Solar-type Binaries and Creation Implications, 2017

Ronald G. Samec, Amber Olsen, Christopher Gray, Ropafadzo Nyaude, James Kring, Jeremy Clark, and T. Shebs.

This continuing study spins off the previously funded project, “The Apparent Age of the Time-dilated Universe: Gyrochronology, Magnetic Orbital Decay of Close Solar-type Binaries” and the new CRS *undergraduate research initiative*, allowing undergraduate mentors and their research students to request research grants from the society research committee.

Our project involved answering the creation time-dilation cosmologies question, What maximum apparent age should be used to characterize the universe? The basis for this part of the study centers on eclipsing binaries undergoing a clear decaying orbit indicative of magnetic braking. This gives dP/dt (days/year) term where P (days) is the orbital period of the binary. From this a *decay age* estimate is possible. Systems included in this study include recently analyzed binary systems (not included in the previous study), NSVS 1083189 (P= 0.4542189 d), V530 Andromedae (P= 0.5771072 d), NSVS 5066754 (P= 0.374780 d), FF Vulpeculae (P= 0.4449758 d), and GSC 3208 1986 (P= 0.4045659 d), where E (epoch) is the time of one orbital period.

In addition, evidence of binary-star coalescence into single stars and the subsequent and violent production of *red novae* will be reviewed. Young-earth Creation implications will be explored.

iDINO Update: Testing the Role of Iron for Prolonged Tissue Preservation

Kevin Anderson

The discovery of pliable tissue and protein fragments remaining in dinosaur fossils presents a direct biochemical challenge to the evolutionary-biased geologic timescale. Persistence of biomaterial in dinosaur fossils with assigned ages of 65–85 million years is not consistent with known biochemical principles. Protein decay studies have repeatedly shown that under ideal condition, even the most stable proteins (e.g., collagen) will still degrade within about one million years. Thus, there is a conflict between these fossils’ assigned age and their biochemical state. Iron catalyzed reactions (Fenton Reactions) have been proposed as a mechanism for extensive preservation of dinosaur biomaterial, presumptively circumventing results from the decay studies. These iron-induced reactions are thought to initiate cross-linking of proteins, thereby decreasing their susceptibility to enzymatic and microbial attack. To test this hypothesis, chicken blood vessels were soaked in various concentrations of a ferric nitrate solution (pH 1). Levels of preservation were determined by microscopically comparing the iron-soaked vessels with water-soaked vessels. This analysis revealed that observable increases of preservation were obtained only with concentrations of iron far in excess of physiological levels. What is more, increasing the pH of the ferric solution dramatically decreased the iron solubility. These results are preliminary but do indicate that iron could not have served as a preservative under a natural setting. Continued work will be necessary to determine if this trend continues under different test conditions.

Author and Title INDEX for Volume 53, 2016–2017

Robert Mullin*

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

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*Robert Mullin, Colorado Springs, CO

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Report from the Creation Research Society Research Committee

Gene Chaffin, Chairman

Following is a list of current research projects that have been awarded grants from the research committee of the Creation Research Society. The decision on whether to award a grant is made on the basis of a vote of the members of the research committee. We are grateful to the donors who have made these grants possible.

Examining the Function of DNA Topoisomerases

DNA topoisomerases are a family of enzymes involved in the maintenance of our DNA. These enzymes are required by cells to prevent DNA from becoming tangled during transcription, replication, and cell division. These enzymes are essential to cell survival and cell division. Pharmaceutical scientists have exploited topoisomerases in order to fight bacterial infections and cancer. A number of widely used drugs target these enzymes in order to disrupt DNA metabolism, cause DNA damage, and kill cells. The goal of the research is a thorough analysis of human DNA topoisomerases with the goal of identifying key regulatory domains and regions. By identifying these regions, we may be able to identify new ways to manipulate enzyme function and, ultimately, to improve cancer therapy. In the process, new facts about design in God's creation will undoubtedly emerge.

The Johnnie Oolite Bed, an Early Flood Deposit

Oolite is a rock consisting of small round grains, usually of calcium carbonate, cemented together. A yellow-orange oolitic carbonate bed outcrops extensively in the Mojave Desert region and beyond. Geologists refer to it as a unique stratigraphic marker. The Johnnie oolite bed, occurs throughout the region with aerial extent of 10,000 square miles or more. Most oolites in modern environs form under shallow and wave-induced conditions. This carbonate bed formed soon after the Noachian Flood started; hence rapid deposition and burial occurred.

The research will investigate the role that depositional processes played in forming the Johnnie oolite bed. The investigation will visit outcrops, macroscopically examine the outcrops for grain size, grading, sorting, indications of cross-strata and other sedimentary structures. Microscopic investigation will evaluate degree of relevant properties of the rocks. The research seeks to document and compare modern versus ancient oolite deposits and evaluate them in terms of how they were deposited.

Statistical Study of Surficial Gravel Deposits

Gravel is one of the most important building materials in modern society, being the chief ingredient in concrete and the standard for structural fill to support buildings, roads, and structures. While the relative ability of a stream or creek to transport fine sediments such as clay and silt is well known, coarse sediments require significant stream power. Laboratory research has centered on sand, and empirical equations have been developed to relate grain size distribution to current speed and stream power. Gravel is too large to be easily investigated in the laboratory, so most of the research for gravel has been based on observed flood events. Since moving gravel requires greater stream power or current strength than sand and fines, it has been of special relevance to debates of catastrophic versus uniformitarian depositional interpretations. The research involves entry of large numbers of existing data from a sizeable area to research patterns that may indicate the directions and relative strengths of the currents that formed the deposits, effectively testing the predictions of uniformitarian versus catastrophic models of earth history.

Characterization of Mummified Petrified Wood from an Eocene Deposit

This study experimentally investigates mummified wood, which is undecomposed wood, and petrified wood from the same piece of material collected at a lignite mine. Chemical analysis reveals that the chemical compositions of mummified wood is similar to those of youthful wood (carbon based), and petrified wood is mainly composed of silicate (silicon based). From microscopic observations, it appears that the species of the original wood is a conifer. The research looks for DNA contained in undecomposed wood on one side. The research attempts to interpret the findings in terms of the Flood geology. Ancient mummified wood provides the opportunity to study the structural and biological preservation of fiber (cellulose), proteins, and possibly Deoxyribonucleic acid (DNA).

Ice Age Megafauna Bone Beds

Dense concentrations of fossilized bones, called "fossil bone beds," point to catastrophic flood destruction and deposition. Dinosaur bone beds are straightforward evidence of the Genesis Flood. "Ice Age megafauna" are also found in dense bone beds. This megafauna can include mammoth, mastodon, saber tooth lion, "cave" bear, hippopotamus, wolf, sloth, and others. The term "Ice Age" is used because these particular animals are associated with the Ice Age in secular literature. Creation literature often agrees with the concept of a time of thick sheets of ice covering portions of the globe but specifies an ice "age" of much shorter duration and occurring several hundred years after the Deluge, according to an idea proposed by Michael Oard. Note that the actual degree of ice sheet coverage during that time is not known and many geomorphic features used to indicate areas that were formerly ice covered were quite possibly formed by water and not by ice. The time period or periods during which the megafauna bone beds were deposited is not clear in the creation literature. Were they deposited during the Genesis Flood, at the end of the Flood, or years later during post-Deluge megaflood catastrophes? This project seeks to clarify the occurrence pattern of the deposits and to interpret the timings and events involved.

Catastrophism in the Type Area of the Lance Formation (Maastrichtian, Cretaceous)

In Wyoming there is an Edmontosaurus dinosaur bone bed in the Upper Maastrichtian Lance Formation. The exact stratigraphic position of the bone bed in the Lance is of interest, since it is very close to the famed Cretaceous-Tertiary boundary (the uppermost stratigraphic record of the dinosaurs and a possible Flood/post-Flood boundary). However, since the stratigraphy of the roughly 2500-foot-thick Lance has never been worked out, the stratigraphic position of the bone bed in the Lance is unknown. Both the bone bed and associated strata appear to be underwater debris flows covering at least hundreds, and perhaps thousands, of square miles of area and having traveled at least scores, and probably hundreds, of miles. This, combined with evidence of massive earthquake activity, suggests the Lance Formation was formed in the Flood or soon thereafter. The research will look for evidence of these types of catastrophism in the region.

Numerical Model Development of Earth's Mantle Dynamics during the Genesis Flood: Multiphase Mantle Compositions and Its Effects on Solid Mantle's Dynamics

Computer simulations of Catastrophic Plate Tectonics (CPT) will be performed using improved numerical modeling approaches to study the realistic rock deformational behavior under conditions of the Genesis Flood. The model will include the multiple mineral phases of the Earth's mantle, and thereby it will take into account the effects of those phases on overall rock's mechanical properties. The microscopic features (e.g., grain size, recrystallization, and phase transformation) and their associated macroscopic thermal and mechanical properties of the rocks will be treated in more detail than ever before in an attempt to model runaway plate movements. This study will provide crucial new understanding on how the microstructures and mechanical properties of multiple mineral phases cooperatively act together to produce the extreme weakening that allowed the global Flood cataclysm to unfold as it did.

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.*

Response to Faulkner E.T. Article

I thank Danny Faulkner for his article on extraterrestrial life, "Does Extraterrestrial Life Exist?" (*Creation Research Society Quarterly* 53:247–254). Here I offer some comments that may be relevant to the subject.

First, I Corinthians 4:9 *might* be an argument against ETs: "For, I think, God hath set forth us the apostles last of all, as men doomed to death: for we are made a spectacle unto the world, both to angels and men" (ASV). Many, if not most, other major translations, are very similar. The KJV is an exception in that the last part of the verse reads, ". . . for we are made a spectacle unto the world, *and* to angels, *and* to men" [emphasis mine]." Admittedly, I am not a Greek scholar, but the phrasing in most translations seems to suggest that the only intelligent created beings that could observe the "spectacle" of the apostles were men and angels. Does this mean that angels and men are the only intelligent created beings in the universe? However, the argument may not be airtight, since perhaps one could argue that other intelligent created beings exist, but they were not able to observe the apostles because they had not yet developed hyperspace technology by the first century AD. (I say this somewhat tongue-in-cheek!) But in that case, I think the other theological arguments against ETs (or at least *intelligent* ETs) that Faulkner presented are very strong.

Second, Faulkner presents a potential theological argument for extraterrestrial life: "Considering the many wonderful sights in so many places in our own world, how many other remarkable vistas must exist on alien worlds? Surely, it is reasoned, God must have made creatures somewhat like us to enjoy these glorious things."

I agree with Faulkner that this is a flawed "argument of economy," but it *does* have some force to it. Since the heavens declare God's glory (Psalm 19:1), it seems like the Lord would be even *more* glorified if intelligent beings were able to appreciate the wonders that He has placed in deep space. Yet even with powerful telescopes, there are many deep-space objects that we now cannot observe in any detail, if at all. Of course, assuming that details are "wasted" if only God can appreciate them is a very humanistic assumption—perhaps God created some of these wonders simply for His own enjoyment! Likewise, the angels can almost certainly view and appreciate these celestial wonders, even at the present time.

However, there is another possibility, too. Perhaps it is the Lord's intention to allow the glorified saints to explore and enjoy these deep-space wonders after Christ's second coming (how delightful!). Such a possibility has long been suggested by conservative biblical scholars, including the late Dr. Henry M. Morris. This might explain why the entire creation, not just the earth, was cursed because of Adam's sin (Roman 8:20–22). Perhaps the entire creation was cursed because the celestial heavens were part of man's intended future inheritance. Had Adam been faithful in the "few" terrestrial matters with which the Lord originally entrusted him, perhaps the Lord intended to entrust him and his descendants with "many" more matters in the ages to come (Matthew 25:23). And perhaps the restoration of this intended inheritance is part of Christ's victory over sin and death.

Jake Hebert
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Defining ETs

In his article "Does Extraterrestrial Life Exist?" (*Creation Research Society Quarterly* 53:247–254), Dr. Faulkner begins with the definition he will use for ETs, "beings that are in many respects like humans." He specifically mentions two factors: they are intelligent and physical.

The reasoning in the section "Did God Create ETs?" however, introduces a different definition and concludes with "there are no ETs." This can lead the reader to think that he has proven that the ETs of the earlier definition cannot exist.

In this section he extends the definition to include morality. There isn't good agreement on what it means to be a moral being. The Darwinian definition could also be applied to apes. The Judeo-Christian definition is obviously God-centered—created with the knowledge of right and wrong and accountable to God. It is this definition that Faulkner will use.

The article also refers to humans as "intelligent beings," as though that were a binary factor and all other life is not intelligent. This view seems to be included in the reasoning as the idea that intelligence is next to godliness. We can't accept that such a correlation exists and thus that a more intelligent person is inherently a more godly or moral person.

Faulkner continues to extend the definition to include having an eternal spirit, saying that anything else would be "nothing like humans." This definition of ETs as having a God-centered morality and eternal spirit is now so far from his starting point (and the world's definition) that it is almost pointless. The summary of it is that ETs that are made in the image of God cannot exist.

That leaves open a very wide area. Is it possible God could have created a being as intelligent as man or more so but who has no spirit and has no more hope of everlasting life than my cat?

I think the reasoning used in this section produces a result that is dangerous. It sounds like a proof that ETs, as the world defines them, cannot exist. If an ET does exist who falls outside the narrow definition, it leaves creation research open to ridicule.

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Conclusions Consequent to the Causes of Soft-Tissue Fossils

The Spring 2015 issue of the *Creation Research Society Quarterly* was the iDINO Project special report (also see Anderson, 2017). In an ordinary reckoning, in a qualitative, not quantitative, analysis toward resolving concern about residual soft-tissue fossil biochemistries (Anderson, 2017), the causes are summarized:

A. Soft-tissue biochemistries in fossils remain from organisms, whether whole or part, which were suddenly buried within almost hermetical conditions.

B. Impervious strata, like proto-bentonite (clay), proto-silicate, and proto-limestone, almost instantly and intimately encased and then permeated a recently suffocated or drowned, but not decomposed, organism or part thereof.

C. Aerobic decompositions quickly ceased, because (1) air was squeezed out, (2) aerobic decomposer microorganisms depleted residual metabolic oxygen, and (3) in-situ geochemistry depleted all remaining pre-metabolic oxygen.

D. Anaerobic decompositions followed and almost as quickly ceased because (1) anaerobic decomposer microorganisms depleted residual metabolic sulfur and sulfides; (2) in-situ geochemistry depleted all remaining pre-metabolic sulfur and sulfides; and (3) peculiarities of residual metabolic and cellular decomposition biochemistries, together with peculiarities of proximate geochemistry, generated toxic carbon compounds, like cyanides and other toxic compounds, such as those of selenium, arsenic, boron, zinc, copper, chromium, nickel, and silver, and those of tin, lead, thallium, cadmium, mercury, and beryllium and (4) generated sterilizing low-energy secondary radiations caused by emissions of radioisotope compounds in proximate geochemistry, like hydrogen 3 (tritium) (0.01859 MeV beta – 12.31 years half-life) and carbon 14 (0.15648 MeV beta – 5715 years half-life).

E. Although most, if not all, of those toxic compounds eventually dissolved, diluted, and dispersed in very slow-moving hydrostatic fluid within sustained almost hermetical conditions during following centuries, the toxicities kept soft-tissue fossil conditions bactericidal.

F. Soft-tissue fossil biochemistries

internally decomposed very slowly, although more rapidly than hard-tissue fossil biochemistries. Internal decompositions of soft-tissue fossil biochemistries follows chemical bond failures caused by various combinations of (1) secondary radiations from entrained radioisotopes' decays, (2) changes of geothermal gradient, hydrostatic fluid composition and pressure, overburden compression and seismic activity, and (3) entropic macromolecular dynamics.

G. Specific chemical bond failure rates of the internal macromolecular decompositions of soft-tissue fossil biochemistries sealed within almost hermetical geologic conditions are limited to lesser, not greater, durations of time. The interdependent laws of mortality, mathematics, physical sciences, biochemistry (both physical and life science), and life sciences, determine the duration of a specific soft-tissue fossil, or a specific hard-tissue fossil.

To this concise qualitative analysis, internal decompositions of soft-tissue fossil biochemistries favor several millennia (thousands of years) since origins and disfavor several deca-millennia (ten thousands of years) since origins of those same fossils. Consequently, within another millennium, most soft-tissue fossil remains are likely to decompose completely and become unidentifiable. Therefore, it behooves everyone to resolve and relieve differences that might prevent fully competent discoveries, preservations, studies, and researches of soft-tissue fossil remains.

Thank you.

Lawrence Smith
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Undue Skepticism About Genesis 1:1 as an Introductory Encapsulation

I am persuaded, for reasons I have expressed elsewhere, that the meaning of Genesis 1:1–2 is properly paraphrased: *In the beginning God created everything over the course of six actual days. As initially created from nothing, the earth was formlessness and emptiness; and darkness was over the face of the deep, and the Spirit of God was moving over the surface of the waters*. Genesis 1:1 thus functions as an introductory encapsulation, the details of which are elaborated upon throughout the chapter. In his article titled "Have Creationists Overlooked an Abundance of Biblical Cosmological Data?" (*Creation Research Society Quarterly* 53:286–296), Jake Hebert raises three objections to understanding Genesis 1:1 as an introductory encapsulation. If I have understood his objections correctly, they do not have the force he attributes to them.

First, Hebert is concerned that if Genesis 1:1 is an introductory encapsulation, then God does not state explicitly that He created the matter that became the earth and other celestial bodies. He fears this leaves open the disturbing possibility that the matter was uncreated, which is a pagan notion. But this misses the fact, recognized widely by scholars, that the phrase "the heavens and the earth" is a merism signifying the totality of creation. Accordingly, Genesis 1:1 is a declaration that in the beginning God created absolutely everything, the totality of all that exists. Nothing save God is exempt; it includes both the completed universe and the material from which it was fashioned. C. F. Keil and F. Delitzsch (n.d., p. 47) state correctly that in Genesis 1:1 "the existence of any primeval material is precluded by the object created: 'the heavens and the earth.' … If in the beginning God created the heaven and the earth, 'there is nothing belonging to the composition of the universe, either in material or form, which had an existence out of God prior to this divine act in the beginning' (*Delitzsch*)."

Many scholars have repeated the point. For example, Wayne Grudem (1994, pp. 262–263) writes, "[Creation *ex nihilo*] means that before God began to create the universe, nothing else existed except God himself. This is the implication of Genesis 1:1, which says, 'In the beginning God created the heavens and the earth.' The phrase 'the heavens and the earth' includes the entire universe." Paul Copan (1996, p. 88, n. 51), writes, "The fact that 'heaven and earth' is a merism signifying 'the totality of cosmic phenomena' points us toward an absolute beginning of the universe—including matter." Kenneth Mathews (1996, p. 143) writes, "Since v. 1 clearly indicates that God created everything that we know as the universe, the 'earth' (v. 2) had its origins ultimately in God." And John Feinberg

(2001, p. 554) writes, "[Genesis 1:1] says he created the heavens and the earth, a typical Hebrew way to refer to all there is. But if in the beginning God created everything, nothing could have existed before Gen 1:1 from which to make the heavens and the earth."

This is confirmed by the statement in Exodus 31:17 (see also Exod. 20:11 and Gen. 1:31–2:1) that everything, "the heavens and the earth," was made in six days. Everything that exists other than God was brought into existence by God during the creation week, so there is no room to claim that matter preexisted the creation week. The absence of an explicit statement of the creation of the earth and the deep referenced in Genesis 1:2 does not diminish the necessary implication that they were brought into existence by God on Day 1.

Second, Hebert objects to taking Genesis 1:1 as an introductory encapsulation because the existence of the earth and the deep in Genesis 1:2 makes clear that some kind of space had been created by God prior to Day 2. In other words, he assumes that the introductory encapsulation view entails a denial of the existence of *any space* prior to Day 2, but that is incorrect. As explained above, the creation of the earth and the deep prior to Day 2 does not require Genesis 1:1 to be a description of that creative work. Rather, that work is a necessary implication from the scope of the merism employed in the introductory encapsulation. Genesis 1:1 announces that in the beginning God created absolutely everything, a work accomplished in the span of six days (Gen. 1:31–2:1; Exod. 20:11; 31:17); so the earth and the deep were created during that span and prior to Day 2—i.e., on Day 1. What was created on Day 2 was not all space but the heavens, or what we know as interstellar space, the space beyond that occupied by the earth and the deep in 1:2. On Day 2 God separated the existing waters into the waters above and the waters below by creating in the midst of the waters an expanse and spreading it out above the earth, thus creating the heavens.

Third, Hebert objects to taking Genesis 1:1 as an introductory encapsulation because the use of ʿ*asah* in Genesis 1:7 (instead of *bara*') implies the *raqîa*ʿ made on Day 2 was made from space that preexisted Day 2. This objection, like the previous one, is based on the misunderstanding that the introductory encapsulation view entails a denial of the existence of any space prior to Day 2. Leaving aside the fact ʿ*asah* and *bara*' can function as virtual synonyms, as indicated in Genesis 1:26–27 and 2:4, it is obvious that some space had been created before Day 2. The space that did not exist was "the heavens." That is the space that was made on Day 2 by separating the existing waters into the waters above and the waters below by creating in the midst of the waters an expanse and spreading it out above the earth.

Ashby Camp
Tempe, Arizona

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Response to Ashby Camp

I thank Ashby Camp for taking the time to read my article and for caring enough to offer his feedback. Actually, I was a little surprised that he objected to my comments on introductory encapsulation. I figured if anyone objected to something in the article, it would be my "out-there" suggestion that God's abode is directly on the other side of the "waters above" and that His throne is located in the direction of the North Ecliptic Pole!

I don't have an objection to Genesis 1:1 being an introductory encapsulation, but I still think it can't be *just* an introductory encapsulation. Let me now try to address Camp's objections.

He discusses my concern that if Genesis 1:1 is merely an introductory encapsulation, that this leaves open the possibility that God did not truly create *everything*, since we would have no explicit scriptural affirmation in Genesis 1 that God actually created the primordial watery mass that would become the earth, nor that God had created the space containing that watery mass. He argues that this is invalid because (1) the phrase "heavens and the earth" is a merism that includes absolutely everything and (2) because Scripture affirms elsewhere (Exodus 20:11) that God made everything. But how does he *know* that this merism includes absolutely everything in existence? How do the scholars that he cites know this? I agree that it *does* refer to everything in existence, but how do they know this *from the text*, if Genesis 1:1 is nothing more than an introductory encapsulation? One could argue that the merism includes only what God created, and that there is something "outside" the merism that He did *not* create. And it seems like someone could reasonably reach that conclusion if Genesis 1:1 is just an introductory encapsulation. Clearly a space of some kind *had* to exist to contain the primordial watery mass, but the introductory encapsulation view leaves us "hanging" as to how that space (not to mention the watery mass itself) actually came into existence. Camp says that "it is obvious that some space had been created before Day 2." But I disagree—it's *not* obvious! Yes, it is obvious that a space *existed* prior to Day 2 (it is a logical necessity), but in the absence of a clear scriptural declaration, it's not obvious that God actually *created* that space.

Of course, Camp and I both agree that God *did* make everything in existence. But if Genesis 1:1 is nothing more than an introductory encapsulation, then God left no clear testimony to the fact that He created *everything* in existence until the time of Moses (Exodus 20:11). And if Genesis 1:1 is just an introductory encapsulation, the argument from Exodus 20:11 may not be airtight, either! Maybe the phrase "heavens and the earth" in Exodus 20:11 doesn't really mean truly *everything*. Maybe it only means the things that God made, leaving open the possibility that there is something that God did not make. But if Genesis 1:1 is the first step in God's sequence of creative activities, then these thorny issues seem to be resolved.

I could easily see Genesis 1:1 being *both* a statement of God's first creative act, as well as an overall summary of His creative activity, but for these reasons, it's hard for me to think of it as being *only* an introductory encapsulation.

Jake Hebert
Irving, Texas

Evolution's Blunders, Frauds and Forgeries

by Jerry Bergman

Creation Book Publishers, Powder Springs, GA, 2017, 312 pages, $14.00

Jerry Bergman continues to produce scholarly books providing facts that devastate Darwinism. If I had the unwavering faith of a true believer in evolution, I would equate Bergman to a perpetual motion machine.

This book gives detailed and documented information on some commonly known embarrassments of evolution, along with lesser-known examples. The reader will learn much about both the former and the latter. The chapter on Piltdown Man provides many new facts, along with this quip: "Tests indicated that Piltdown had made a monkey out of almost everyone" (p. 174). Bergman notes, "Entire chapters were devoted to the Piltdown in major anthropology books of the day" (p. 185). It is interesting that the *New York Times* was doing fake news as early as 1912, when it proclaimed the Piltdown phenomenon as solid science.

Bergman writes, "It should not surprise anyone that fraud is common in attempts to prove Darwinism because major problems have always existed, and still exist, in this worldview" (p. 15). As a former public-school teacher, I have shown that knowledge about those "major problems" is systematically censored (Priest, n.d.).

Bergman comments, "Darwin was correct when he titled his 1871 book *The Descent of Ma*n and not *The Ascent of Man*" (p. 24). Indeed, "over 5,000 genetic diseases are now known and the number is growing" (p. 32).

Blunders, frauds, and forgeries are also prevalent in areas of science beyond evolution, particularly medicine. The author notes that problems have occurred at "Cornell, Harvard, Sloan-Kettering, Yale and so on," ranging from "fudging data to plagiarizing" (p. 294). The reasons for this "include honest errors, carelessness, the push to be 'first', research grants, and the lure of money and prestige" (p. 309).

This book has thorough references; chapter 11 alone has 165 citations.

Karl Priest
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Reference

Priest, Karl. N.d. Evolution resolution. http://www.insectman.us/testimony/resolution.htm.

Instructions to Authors

Submission

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 Star-Office/Open Office (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.

All submitted manuscripts will be reviewed by two or more technical referees. However, each section editor of the *Quarterly* has final authority regarding the acceptance of a manuscript for publication. While some manuscripts may be accepted with little or no modification, typically editors will seek specific revisions of the manuscript before acceptance. Authors will then be asked to submit revisions based upon comments made by the referees. In these instances, authors are encouraged to submit a detailed letter explaining changes made in the revision, and, if necessary, give reasons for not incorporating specific changes suggested by the editor or reviewer. If an author believes the rejection of a manuscript was not justified, an appeal may be made to the *Quarterly* editor (details of appeal process at the Society's web site, www.creationresearch.org).

Authors who are unsure of proper English usage should have their manuscripts checked by someone proficient in the English language. Also, authors should endeavor to make certain the manuscript (particularly the references) conforms to the style and format of the *Quarterly*. Manuscripts may be rejected on the basis of poor English or lack of conformity to the proper format.

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

Appearance

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

Submitted manuscripts should have the following organizational format:

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

2. Abstract page. This is page 1 of the manuscript, and should contain the article title at the top, followed by the abstract for the article. Abstracts should be between 100 and 250 words in length and present an overview of the material discussed in the article, including all major conclusions. Use of abbreviations and references in the abstract should be avoided. This page should also contain at least five key words appropriate for identifying this article via a computer search.

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

4. Body of the text. Two types of headings are typically used by the *CRSQ*. A major heading consists of a large font bold print that is centered in column, and is used for each major change of focus or topic. A minor heading consists of a regular font bold print that is flush to the left margin, and is used following a major heading and helps to organize points within each major topic. Do not split words with hyphens, or use all capital letters for any words. Also, do not use bold type, except for headings (italics can be occasionally used to draw distinction to specific words). Italics should not be used for foreign words in common usage, e.g., "et al.", "ibid.", "ca." and "ad infinitum." Previously published literature should be cited using the author's last name(s) and the year of publication (ex. Smith, 2003; Smith and Jones, 2003). If the citation has more than two authors, only the first author's name should appear (ex. Smith et al., 2003). Contributing authors should examine this issue of the *CRSQ* or consult the Society's web site for specific examples as well as a more detailed explanation of manuscript preparation. Frequently-used terms can be abbreviated by placing abbreviations in parentheses following the first usage of the term in the text, for example, polyacrylamide gel electrophoresis (PAGE) or catastrophic plate tectonics (CPT). Only the abbreviation need be used afterward. If numerous abbreviations are used, authors should consider providing a list of abbreviations. Also, because of the variable usage of the terms "microevolution" and "macroevolution," authors should clearly define how they are specifically using these terms. Use of the term "creationism" should be avoided. All figures and tables should be cited in the body of the text, and be numbered in the sequential order that they appear in the text (figures and tables are numbered separately with Arabic and Roman numerals, respectively).

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

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

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

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

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

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

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

Special Sections

Letters to the Editor:

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

Editor's Forum:

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

Book Reviews:

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

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Creation Research Society

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

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

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

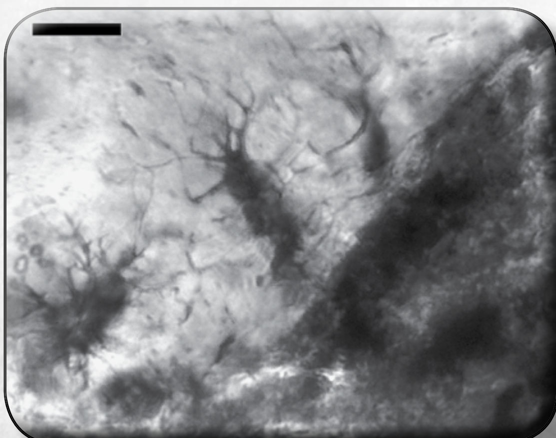
Statement of Belief—Members of the Creation Research Society, which include research scientists representing various fields of scientific inquiry, are committed to full belief in the biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution)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

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

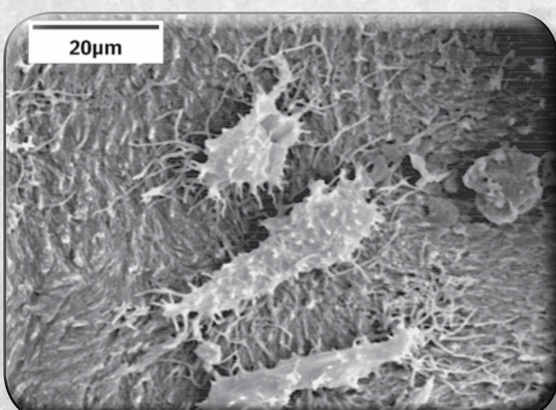
iDINO II

Investigation of Dinosaur Intact Natural Osteo-tissue

A fragment of the *Triceratops* brow horn. Fragments, such as this one, still contain tissue and cells.



Microscopic examination of tissue extracted from a *Triceratops* horn reveals bone cells still present.



Electron microscope picture of intact bone cells still in tissue extracted from a *Triceratops* horn.

How can pliable, stretchable tissue survive inside dinosaur fossils for over 65 million years?

How can this tissue still contain intact cells and even dinosaur proteins?

How can this fragile biological material survive for so long?

The answer to these questions directly challenges the current, evolutionary-biased, geologic timescale.

The Creation Research Society began its iDINO research initiative for the purpose of studying soft tissue in dinosaur fossils. The first phase of the project detected pliable, unfossilized tissue in a brow horn of a *Triceratops*. Within this tissue were intact osteocytes (bone cells). Some results from the iDINO project have been published in a technical microscopy journal and presented at an international microscopy conference. The Spring 2015 issue of the *Creation Research Society Quarterly* also features a special report of the iDINO project. Plus, to further spread the important information about soft tissue, the Society is developing a video (Echoes of the Jurassic).

The **second phase** of the project (iDINO II) will look more extensively at the process of tissue preservation. Evolutionists have offered various theories of how this tissue could survive for millions of years. iDINO II will methodically investigate these preservation claims, assessing their plausibility.

The iDINO results have already provided a strong challenge to the evolutionary worldview. More extensive and detailed examination may provide even stronger evidence that the age of dinosaur fossils is far less than 65 million years. To this end, the Society continues to seek those willing to fund this project with either one-time gifts or monthly donations.

For more information contact us at (928) 636-1153 or crsvarc@crsvarc.com.

Also visit http://tinyurl.com/nphm2c4 for project updates and details.