


CREATION RESEARCH SOCIETY



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- **STRATEGIES FOR FITTING PRECAMBRIAN ROCKS INTO BIBLICAL EARTH HISTORY**
 - **CHLOROPLAST GENOME-BASED BARAMINOLOGY STUDY OF LILIALES**
 - **DARWINISM, INFERIOR RACES, SPORTS, AND HITLER'S OLYMPICS**
 - **INSIGHT INTO JOB'S THEOLOGY FROM A NEW IDENTIFICATION FOR LEVIATHAN**
 - **A TIPPING POINT FOR IDENTIFYING MILANKOVITCH CYCLES IN ROCKS**
 - **AUTHOR AND TITLE INDEX FOR VOLUME 59**

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Volume 60
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Articles

- Insight into Job's Theology
from a New Identification for Leviathan** 72
Brian Thomas and Daniel A. Biddle
- Chloroplast Genome-Based
Baraminology Study of Liliales**..... 84
Matthew Cserhati
- Suggested Strategies for
Fitting Precambrian Rocks
into Biblical Earth History** 97
Michael J. Oard, John K. Reed, and Peter Klevberg
- Darwinism, Inferior Races,
Sports, and Hitler's Olympics**..... 112
Jerry Bergman
- Author and Title Index
for Volume 59, 2022–2023** 120
David V. Bassett

Departments

- Notes from the Panorama of Science
A Tipping Point for Identifying
Milankovitch Cycles in Rocks**..... 125
- Letters to the Editor** 128
- Media Reviews** 133
- Instructions to Authors**..... 135
- Membership/Subscription Application
and Renewal Form**..... 137
- Order Blank for Past Issues**..... 138

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Volume 60
Number 2
Fall 2023

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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Insight into Job's Theology from a New Identification for Leviathan

Brian Thomas and Daniel A. Biddle

Abstract

Prior work identified a sauropod as Job's behemoth. Although not possible from the standpoint of secular history, Biblical Creation positions the majority of Earth's fossils as deposits from Noah's Flood. As with the behemoth, it thus opens the possibility of identifying Job's leviathan (Job 41) as an extinct creature. Arguments in favor of Job's leviathan as a real animal are presented. Next, features from four candidate animals are compared with anatomical and behavioral hints from Job 41. We find that a new description of an extinct non-dinosaur reptile named *Deinosuchus* offers heretofore unknown anatomical details that commend it as a top candidate for a literal leviathan. Finally, a few theological implications of identifying Job's leviathan as a historical animal are explored.

Key Words: Deinosuchus, Job, Leviathan, mythology, Spinosaurus

Introduction

God's discourse to Job at His appearance in the whirlwind (38:1) moved from physical processes (38) to animal anatomies and behaviors (39–41). The discourse includes some 77 questions all purposed to persuade the hearers that Job, and by extension all those who read Job, should humble themselves before a mighty but trustworthy God (Morris, 2007, p. 128). Indeed, only after the Lord's lengthy speech about a leviathan (41:1–34) did Job finally repent (42:6). Many Bible readers find it tempting to treat this creature as non-literal, for example as myth or metaphor. For ex-

ample, "Whether the description in Job 38–41 moves from physical creation to mythological imagery, the message is the same: Yahweh, not Job, is the sovereign creator who has absolute power over creation" (Mangham and Hamilton, 2016). However, if these animals upon which the Lord based his questions and founded his arguments were not animals after all, then would His words have produced that repentance? God is regularly referring to actual creatures in order to show his authority over them. Reducing Leviathan to simply a mythical beast seems to undermine this.

The assignment of a real animal, either extinct or extant, would confirm God's trustworthy character on the basis of Him referencing real animals to illustrate His real characteristics. In our prior work, we argued on the basis of descriptions from Job 40:15–24 and fossils that Job's behemoth matches the anatomy, inferred habitat, and implied behaviors of diplodocid dinosaurs (Lawrence, Thomas, and Taylor, 2023). We noted especially a sauropod's "strength in its hips" (40:16) and "tail like a cedar" tree (40:17). This interpretation would not be possible within mainstream, secular history which separates humankind from dinosaurs by 65 or so million years. In contrast, certain advantages of Biblical Creation's chronological structure permit fossilized animals as options to

identify the three less-familiar animals found in God's discourse to Job, as discussed below.

Basic tenets of Biblical Creation include a recent (thousands, not billions of years ago) creation of the heavens, earth, seas, and all that is in them and a global Flood that deposited most of the Earth's sedimentary layers and the fossils they contain (Clarey, 2020). Passages such as the 4th Commandment in Exodus 20:11, Genesis 1, 5, 10, and Luke 3:23–38 provide the basic foundations for such views. This model offers at least three advantages over modernist mainstream models. First, Biblical Creation resolves the theological dilemma of fitting death, in the form of billions of fossils, before sin. A history that denies death as sin's follow-on consequence undermines the historical and logical foundations that Paul used in his arguments for the Gospel in Romans 5:12 and 1 Corinthians 15:21–22. In contrast, Biblical Creation holds that the Flood formed the fossils about 1656 years after sin, restoring one's perception of sin as the actual cause of death from which sinners need rescue (Johnson and Ice, 2002). See Hebrews 9:26 for the Bible's placement of a need for a sin covering ever since the beginning of creation, i.e., Genesis 3. Second, Biblical Creation harmonizes with scores of natural processes that indicate a recent creation (Thomas, 2020). Lastly, it upholds the doctrine of the perspicuity of Scripture by allowing an unforced exegetical basis for Genesis 1 and passages that quote it (Mark 10:6) or refer to it (Romans 1:20) as historical narrative.

Most of the animals to which the Lord refers in His discourse to Job are extant, but God's description of a "wild ox" better fits the extinct robust bovid aurochs. Depicted in the Middle East in places such as the Ishtar Gate and known from European fossils (Figure 1), aurochs went extinct in the 16th Century. Table 1 lists animals from God's discourse. If behemoth was also an extinct animal as we have argued, then they

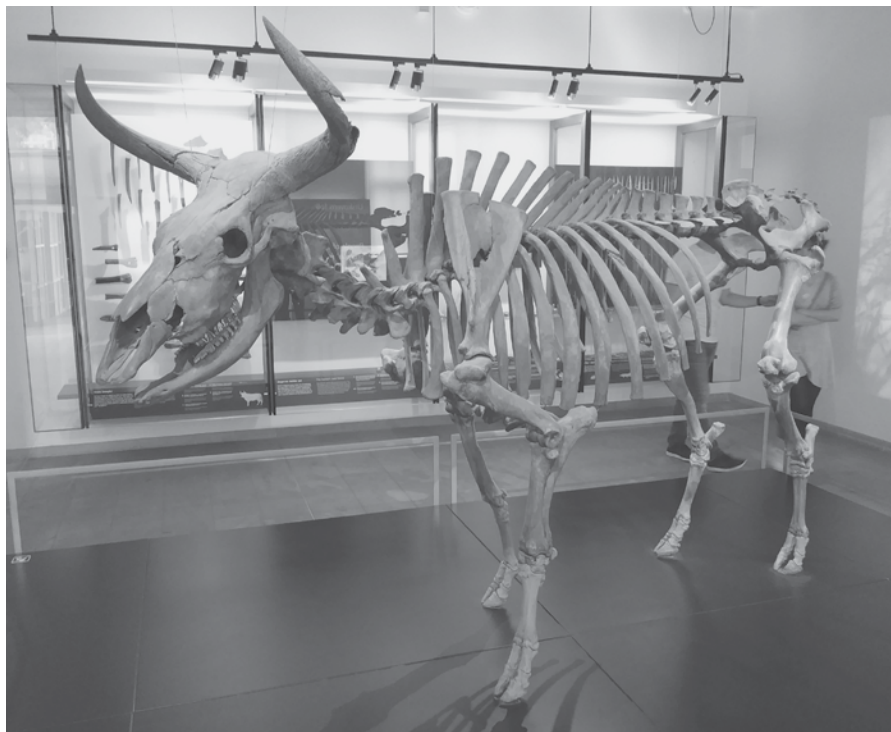


Figure 1. Skeletal remains of aurochs, an extinct and robust bovid variety, on display at the National Museum of Denmark and likely one of the animals in God's discourse to Job. Image: Brian Thomas.

offer precedents for the use of extinct creatures to identify with a leviathan.

Another staple of Biblical Creation is the placement of a single Ice Age after the Flood and from residual effects of that Flood. This position helps bring Job into contact with difficult-to-imagine creatures like sauropods and leviathans.

Although Job does not contain firm chronological markers like certain other Scriptures, clues in the text help bracket the likely time of Job's experiences. A few of these clues are noted below. They suggest that Job's lifetime at least partly overlapped the Ice Age (Hebert, 2014). The much wetter climate of the Middle East at that time opens the possibility of Job's first-hand familiarity with the animals that the Lord brought to Job's attention and especially to wetland creatures including possibly now-extinct reptiles (Vardimann, 2013). Higher pre-

cipitation rates during winter months at the higher altitudes of the Ash Sharat mountain range east of the Jordan may even comport with Job's frequent mentions of snow and ice.

Names provide the first chronological clue. If Eliphaz the Temanite of Job 3:1 made his home in the then-prominent city of his son and chief Teman (Genesis 36:15–16), then he is the same as the Eliphaz in Genesis 36:11. If so, then Eliphaz would have been Esau's son (Genesis 36:4, etc.). Since Esau's brother Jacob did not die until 1859 BC in Steinmann's chronology, then Eliphaz may have lived in the 19th century BC (Steinmann, 2010).

Second, Job's longevity is recorded in Job 42:16 as one hundred and forty years. A plot of the systematic decline in post-Flood patriarchal longevity supplies a background to estimate the

time in Earth history when people still lived that long (Sanford, Pamplin, and Rupe, 2014). Accordingly, Job would have lived roughly after Isaac lived for 180 years (Genesis 35:28) and his great, great grandson Kohath for 133 years (Exodus 6:18). We plot these Biblical data in Figure 2. This span overlaps Jacob and Esau's lifetimes and aligns with the 19th-century-BC lifetime noted above.

As a third chronological clue, Job and his friends referenced early Genesis elements. Eliphaz referred to a Flood having taken away the wicked (Job 22:15–16). This matches God's rationale from Genesis 6 for the Flood. Job refers to Adam in 31:33 as blaming others for his own sin, which Adam did according to Genesis 3:12. Such familiarity among Job's friends with antediluvian and diluvian details indicate common knowledge suited to those living only centuries after the Flood.

Job references snow, frost, and ice more than any other book in the Bible. This suggests first-hand experience with frozen precipitation that is today rare in the land of Uz, which we identify as having been later named "Edom" via Genesis 36:1, 28. This region overlaps the Jordan River, so named in Job 40:23. If behemoths (sauropods) preferred tropical wetlands as both fossils and Job 40 indicate, then Job could have literally seen behemoths. As the borders of Uz included modern-day Eilat, then wealthy and wide-trading Job would also have known the local marine life including possibly a now-extinct leviathan. Job in the Ice Age, during which time the Middle East was tropical (see Genesis 13:10), would have contained wetlands that suited large reptiles. Indeed, large-bodied mammal and possibly reptile fossils were excavated not far from Uz at Jordan's Azraq Oasis in 2016 (Nowell, 2016). These considerations permit us to evaluate both extant and extinct fauna as candidates for a literal leviathan. Such an evaluation hinges

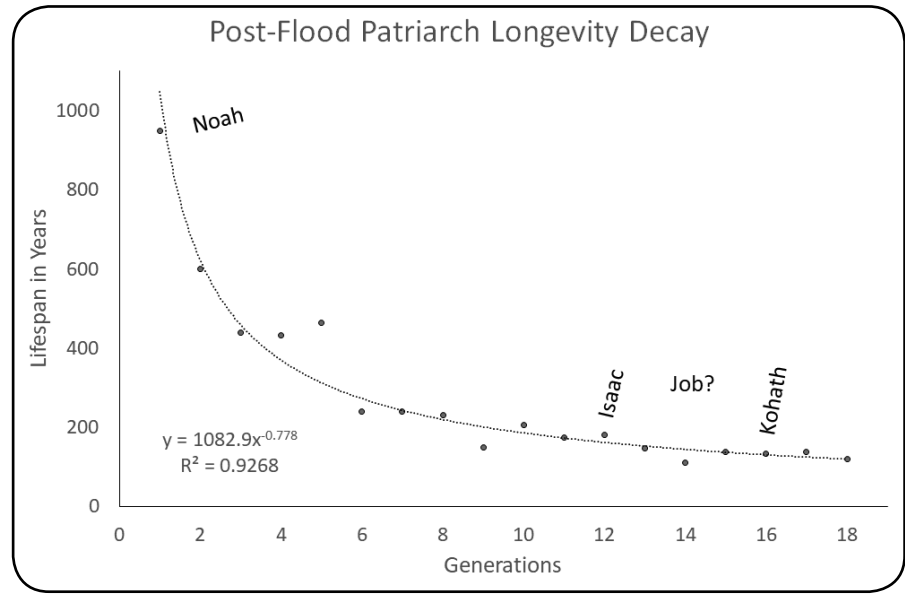


Figure 2. Post-Flood patriarchal longevity plots Job's lifespan of 140 years a few centuries after Abram and during the 'Ice Age.'

on the conclusion that God was here describing a real creature. Was He? The identification of a real animal as Job's leviathan would validate the purpose of the Lord's discourse in Job 38–41—to magnify the Creator's trustworthy power by comparison with the power found in His creation. A Biblical Creation model of Earth history adds fossils to the list of candidates for leviathan.

What About Leviathan as Metaphor?

If the Lord intended the leviathan as a metaphor, and especially if as a myth, then we need not bother with trying to identify an animal to match it. Readers who prefer to spiritualize leviathan find solace in at least three sources. First, highly regarded expositors interpret much of Job 41 as metaphorical or at least hyperbolic. For example, Walton and Viscaïno draw upon Ugaritic myths to relegate Job's leviathan to a mythical "chaos creature," but they supply no

evidence from within the Scriptures for this interpretation (Walton and Viscaïno, 2012).

Also, Keil and Delitzsch wrote: "Behemoth and leviathan, says Herder, are the pillars of Hercules at the end of the book, the *non plus ultra* of another world [distant from the scene]. What the same writer [Herder] says of the poet [who wrote Job], that he does not 'mean to furnish any contributions to Pennant's *Zoologie* or to Linnaeus' *Animal Kingdom*,' the expositor also must assent to" (Keil and Delitzsch, 1989). But why must one assent to ignoring the fossil life Pennant and Linnaeus did not happen to focus on? Keil and Delitzsch do not say.

Whether interpreting these two creature names as myth, hyperbole, metaphor, or some combination thereof, they all restrict one's animal options to those alive today or even in Pennant's day (the 18th century). This whole paradigm derives from modernist secularization's denial of Biblical history and authority, not from exegesis of the Bible.

Thus, despite various expositors’ assertions of myth and demands for symbols “distant from the scene,” the list of specific, extant, literal animals that form the context of God’s lesson in Job 38–41 (Table I above) suggests that the reader identify all those animals as literal. The Bible places leviathan in a realistic context, along with the horse, ostrich, eagle, goat, and other animals that God described for Job.

Indeed, if behemoth was not physically present in Job’s time and place, then God would have issued an impossible command when he twice told Job to “Look now” (הִנֵּה; *hinne*, “to see”) at behemoth (Job 40:15 & 40:23). Similarly, God would be presenting a false possibility when He suggested that Job imagine laying his hands on leviathan (41:8) since one cannot physically touch a metaphor.

We agree in principle with López who wrote: “We have seen the first speech deals with natural creatures. Thus the point that they were not created for man, first advanced there, reaches its climax here. But this is true only if Behemot [author’s transliteration] and Leviathan are actual existent animals of flesh and blood. If they are mythological monsters whom God has subjugated or destroyed eons ago, they are totally irrelevant to the discussion” (López, 2015). If mythological animals would be irrelevant to the discussion of creatures not being created for man, then mythological animals would in a similar way be irrelevant to the discussion of God being powerful enough to approach those untamable creatures.

The second source of solace for the non-literal views comes from the fact that no modern reader has claimed to witness an immense, toothy sea creature that can breathe fire. Guarding against chronological snobbery helps in this case, since our ancient forebears may well have seen or touched animals back then that have since gone extinct.

Table I. Living status of the fauna found in God’s discourse to Job (38–40).

Reference	Hebrew (MT)	English (NKJV)	Extant?
38:39	לָבִיא	Lion	Yes
38:41	עֹרָב	Raven	Yes
39:1	יַעֲלִי	Wild mountain goat	Yes
39:1	אֵילָוִת	Deer	Yes
39:5	פָּרָא	Wild ass	Yes
39:5	עֲרוּד	Onager	Yes
39:9	רָאֵם	Wild ox (Aurochs)	No
39:13	עֹלָס	Ostrich	Yes
39:13	נוֹצָה	Stork	Yes
39:19	סוֹס	Horse	Yes
39:26	נָז	Hawk	Yes
39:27	נְשֹׁר	Eagle (Vulture)	Yes
40:15	בְּהֵמוֹת	Behemoth (Sauropod)	No

Lastly, there indeed exist metaphorical uses of “leviathan” in the Scriptures and these offer the temptation to make all its uses metaphorical. However, use of a word as a metaphor in one context does not require metaphorical use in all contexts. In contrast to sentiments like that of Anderson who said “It is not easy to tell whether these creatures are real or fabulous,” the context of each passage does indeed identify whether its use of leviathan is metaphorical or literal (Anderson, 1976). Difficulties here may arise from modern man’s lack of familiarity with extinct fauna or from modern man’s penchant for ‘deep time,’ but not from Biblical context. We thus consider these contexts next.

Leviathan in Scripture

Job himself uses the word in his first lament.

“Oh, may that night [of my birth] be barren!
 May no joyful shout come into it!
 May those curse it who curse the day,
 Those who are ready to arouse Leviathan” (Job 3:7–8, NKJV).

In context, Job here says essentially, “May those curse it...who are ready to arouse total misery.” However, this use of leviathan as a metaphor for total hopelessness loses even this metaphorical meaning without an actual animal as a referent.

Next, Asaph in Psalm 74:14 calls upon the Lord to rescue his people

from the reproach of an “adversary” (v. 10), likely an impending military threat. He then says,

“You divided the sea by Your strength;
You broke the heads of the sea ser-
pents in the waters.
You broke the heads of Leviathan
in pieces,
And gave him as food to the people
inhabiting the wilderness.”

The author here recalls the Lord’s former mighty deeds as the basis for his petition for the Lord to work another mighty salvation. The divided sea refers to the Exodus rescue. The book of Exodus records no slaying of literal sea creatures, nor any butchering of an animal for literal distribution of its carcass to feed the more than two million Israelites. Thus, the sea monsters and “Leviathan” here signal the human rulers and/or their “principalities” (Ephesians 6:12) that the Lord overthrew during the Exodus and Conquest.

Psalm 104 speaks differently about it. Here the Lord’s power and provision seen throughout creation are praised.

“This great and wide sea,
In which are innumerable teeming
things,
Living things both small and great.
There the ships sail about;
There is that Leviathan
Which You have made to play there”
(vv. 25, 26).

Here, the sea and its teeming life are literal and the ships are literal. Thus, the leviathan in this context seems also to refer to a literal animal.

This Psalm also happens to offer a few hints into the leviathan’s anatomy and behavior. Ancient sailors would not see leviathans playing within their shipping lanes if it used gills for respiration and so remained at depth. Therefore, this suggests that leviathans had to surface because they breathed with nose, mouth, and lungs like modern marine mammals and reptiles. Also, one of the Lord’s purposes in making the leviathan was for it “to play,” (שָׂחָה, *sahaq*, literally

**The context of Job,
and in particular the
Lord’s discourse
to Job,
indicates a literal
leviathan.
So, what WAS
this animal?**

“frolic”). In sum, this Psalm suggests that the leviathan was a noteworthy marine reptile that surfaced for air and played while there.

The last reference again uses “leviathan” metaphorically. Isaiah 27:1 says,

In that day the Lord with His severe
sword, great and strong,
Will punish Leviathan the fleeing
serpent,
Leviathan that twisted serpent;
And He will slay the reptile that is
in the sea.

Motyer outlined the context of this verse as occurring within a broad chiasm that spans from 24:1 to 27:13 and with Mount Zion at the center (25:6–12) (Motyer, 1993, p. 220). He notes a final gathering of a universal Israel (i.e., all of God’s followers from all time) described in 27:1–13 (Motyer, 1993, p. 195). Just before the Lord gathers His own, He defeats the evil spiritual enemies in 27:1. A literal slaying of an animal would not help clear the way for the Lord to gather His followers to be with Him forever, so the leviathan in this case artfully stands in for the accuser.

The clear contexts of these Scriptures present three metaphorical uses and one literal use of “leviathan.” In similar fashion, the context of Job, and in particular the Lord’s discourse to Job, indicates a literal leviathan. So, what was this animal?

Leviathan’s Features

To begin answering the question of what animal a leviathan may have been, we first list anatomical and behavioral clues given in the two passages that refer to a literal animal by that name. These texts should restrict enough anatomical options to enable a process of elimination to help with identification.

Psalm 104 suggests nostrils and lungs for respiration as noted above. It also enjoyed playing. Most of Job 41:1–7 lists ten rhetorical questions about leviathan with all ten answered in the negative. From these questions we discern that this animal was too large and too thick-skinned for a hook and line to catch it. It is too aloof to succumb to Job’s—or by extension any human’s—attempts to tame it or even corral it as a showpiece. Its hide is too tough for harpoons, spears, darts, arrows, or swords to penetrate. Metaphors do not deflect weapons used to hunt both living and extinct creatures.

Job 41:9–10 show it as an utterly overwhelming animal to behold and unapproachably terrifying. Job 41:12 points out limbs and graceful proportions, but these features apply to many aquatic or amphibious vertebrates. Job 41:14 compares the size of its mouth to doors with “terrible teeth all around” its edges (14). Then verses 15–17 describe its skin scales as occurring in rows (i.e., down its back). They are so thick that they “are his pride” (15) and attached tightly and close to one another. These features restrict our identification to marine reptiles.

The Lord dedicates four verses (Job 41:18–21) to just the one feature of breathing fire. Its flesh was fashioned

firmly (23). Its heart was hard, presumably referencing dense muscle tissue (24). Verse 25 references its “crashings” (שֶׁבַר; *sheh'var*), a word that when used literally has referred to breaking walls (Isaiah 30:13), destroying kingdoms (Lamentations 3:47), and crushing grain as in a mill (Genesis 42:1). An animal that thrashes enough seawater to compel men to flee in fear fits well here.

Job 41:30 compares his undersides to potsherds, a likely reference to angular ventral body scales. Job 41:30b notes that the leviathan makes marks in the mire or mud. This adds a critical limitation in possible anatomical arrangements, for this means the creature was amphibious. This rules out the large-bodied marine reptiles (e.g., plesiosaurs and mosasaurs).

In Job 41:31, two telling behaviors come to the fore. In 41:31a, the leviathan “makes the deep boil,” like what is seen atop a pot of boiling water. One animal group that today expresses this literally is discussed below. Then in 41:31b the author notes another of the leviathan’s behaviors as stirring the water like a person would stir or mix (i.e., with a stir-stick) a pot of ointment. This indicates vigorous spinning. The shining wake of verse 32 surely indicates size and speed, and thus peerless strength. Finally, just as behemoth was the “first of the ways of God” (40:19), so “there is nothing like” Leviathan (41:33). All agree that no living amphibious reptile lives up to all these literal descriptions.

Quality Candidates for Leviathan

Zuck (1978) aligns with many commentators including Keil and Delitzsch (1989) in identifying the leviathan as a crocodile. Spears and harpoons launched by human arms can penetrate crocodiles, but according to the text, not leviathan. Discussion below regarding fossil scutes should illuminate this text. Places like Crocodylus Park in Australia’s Northern Territory show that unlike le-

viathan, mankind can corral crocodiles for entertainment. And crocodiles do not breathe fire.

These shortcomings constrain commentators who identify leviathan as a large crocodile (*Crocodylus niloticus*) to force undeserved meanings into the text. Zuck, for example, wrote that the descriptions of a sea creature that breathes fire “May be explained as the way God spoke of the crocodile’s breath and water, which when emitted from its mouth, look in the sunlight like a stream of fire” (Walvoord and Zuck, 1985). Who has ever mistaken a glint upon a breath for flames? If God had a sunlit snort in mind, then why would He not have said so?

Further, the leviathan passage describes the beast producing something from its nostrils and mouth that resembles actual fire in five respects: “burning” lights, sparks “shooting out,” smoke (from its nostrils), coals (breath), and flame (from its mouth) (vv. 19–21). This list describes actual fire in every visible respect. This admittedly seems difficult to accept. Since God outfitted His creatures to fit their environments, of what use would fire be to a sea creature? However, several options may help deflate this objection. Fire underwater would seem insufficient for hunting, but one might imagine fire suitable to hunting sea-surface flyers like familiar water birds and pterosaurs. However, since leviathan made marks in the mire, it spent at least some time on land. It could use fire for defense there. Second, in keeping with the “water dance” discussed below among modern crocodiles, perhaps leviathan used its fire in a mate attraction ritual. Having said this, the main point here is that since modern crocodiles do not breathe fire, they seem less likely to be identified with Job’s leviathan.

It would diminish the Lord’s argument from the lesser leviathan to the greater Creator to have aggrandized the creature’s features and so falsely elevate His own glory. On the other hand, if

an extinct animal meets the relevant descriptions, then the exegete would be freed to permit the text to mean what it more plainly says instead of having to explain it as meaning something different. With fishes, mammals (i.e., whales), mosasaurs, and plesiosaurs ruled out by the Biblical texts as noted above, remaining candidate animals should include the largest extinct reptiles with “limbs” (Job 41:12) capable of vigorous swimming and even thrashing. Those limbs should be sufficient to have carried the vast animal onto land (30). With these restrictions in mind, Booker (2005) offered *Sarcosuchus*, a 9-meter-long, extinct alligatoroid as Job’s leviathan. This meets the Biblical criteria of doors with teeth for a mouth, awe-striking size, and rows of scales. However, *Sarcosuchus* did not have the flexibility in its caudal vertebrae required to spin in the water so as to make it like a man stirring his “pot of ointment” (Job 41:31b). Modern alligators show this behavior as a “death-roll,” the significance of which we discuss below. The maneuver requires a tail that can angle sufficiently from the central body axis. In addition, fossils contain alligatoroids even larger than this one.

A 2014 study revealed anatomical details from disarticulated *Spinosaurus egypticus* remains from the Kem Kem beds in Egypt (Ibrahim, 2014). Its authors concluded based on limb proportions and indications of a flexible tail that its 15-meter-long body had amphibious capabilities. Clarey (2015) therefore suggested spinosaurs as likely candidates for Job’s Leviathan. This option meets the requirements of an immense animal that could make “marks [footprints] in the mire” (Job 41:30) and swim at sea. It certainly had a door-sized mouth with “terrible teeth” (Job 41:14). However, it also had a bony sail that extended over two meters from its dorsal spine (Figure 3). One would think that God would have included such a prominent structure in His descriptions of the awe-striking glory of this animal. Also, this dorsal

sail would significantly hinder spinning or twirling behavior underwater as Job 41:25, 30 note.

***Deinosuchus* as Leviathan**

Deinosuchus refers to a genus of massive, extinct reptiles. Its name derives from Gk. δεινός (*deinos*) meaning “terrible,” and Gk. σούχος (*soukhos*) meaning “crocodile.” A 2020 analysis of *Deinosuchus* fossil remains added new information to our knowledge of its anatomy and thus inferred behavior (Cossette and Brochu, 2020). These features commend this animal as perhaps the closest match so far considered for Job’s leviathan. It ranks about equally well with *Sarcosuchus* and *Spinosaurus* in terms of body size, implied tooth size, mouth size, and amphibious body structure. However, at 11–12 meters long, this monstrous alligatoroid grew 2–3 meters longer than *Sarcosuchus*. This length makes it one of the largest predators in history, even heavier than *T. rex* (Schwimmer, 2002).

Unlike *Sarcosuchus*, *Deinosuchus*’ caudal vertebrae show the tail flexibility required to produce the “death roll” maneuver (Cossette and Brochu, 2020). Its teeth were larger than *Spinosaurus*. “Their teeth were the size of bananas” (Taylor & Francis Group, 2020). And unlike *Spinosaurus*, it had no stiff dorsal sail to prevent it from subaqueous rotation. These features alone position *Deinosuchus* as perhaps the top candidate for a leviathan, but four additional features align even more tightly to the Job 41 text.

Both *Sarcosuchus* and *Deinosuchus* had dermal scutes (pronounced “scoots”) arranged in rows along its dorsum. Modern crocodiles have scutes, but *Deinosuchus* had the largest. Researchers refer to them as “massive” (Cossette and Brochu, 2020), “unusually large, heavy, and deeply pitted,” and “proportionately much thicker than modern crocodylians” (Holland, 1909). Their robustness could have even

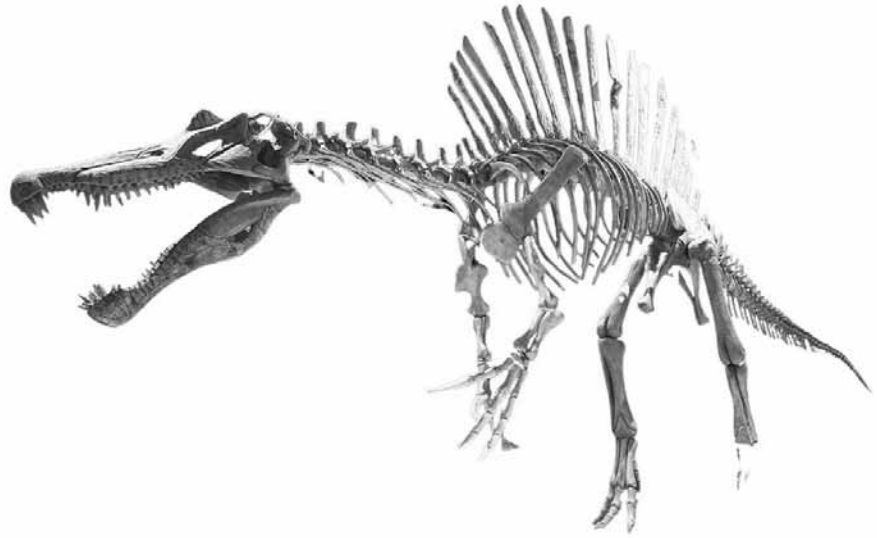


Figure 3. At fifteen meters long, the extinct theropod *Spinosaurus egypticus* meets some of the Job 41 characteristics of Job’s leviathan. Image: Adapted from Wikimedia Commons. Author: Kabacchi. Adaptation: Salah DeMichele.

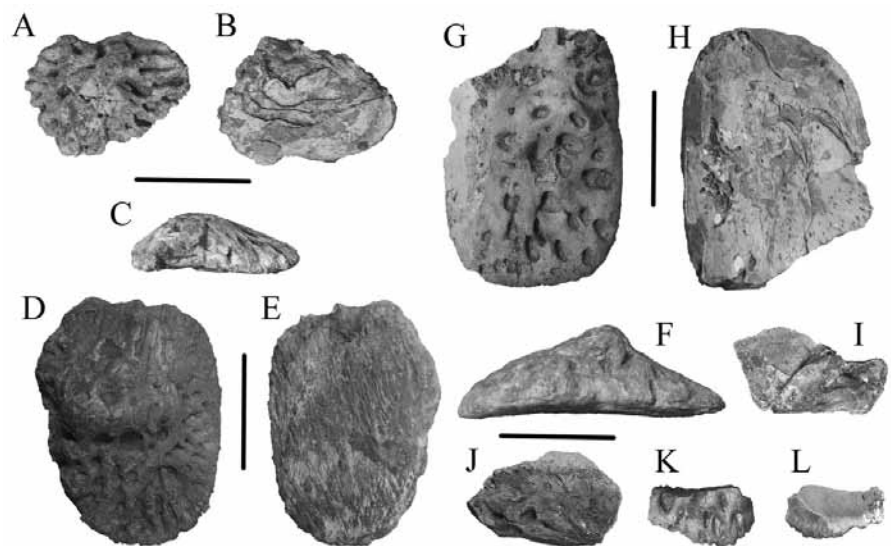


Figure 4. Osteoderms of *Deinosuchus* WSC 285 (Western Science Center, Hemet, California). Pits represent deeply rooted tissue attachment points. Scale bars 5 cm. Image: Mohler et al., 2021, *PeerJ*.

contributed to the animal’s load bearing and locomotion out of water (Schwimmer, 2002).

A scute is a disk-like or semispherical bone grown within skin. It does not articulate with the skeleton, but connective



Figure 5. *Deinosuchus* reconstruction at the Natural History Museum of Utah shows rows of tightly arranged scale scutes on its dorsal surface. More recent fossil finds have shown this skull as less than accurate. A more accurate anatomy is shown in Figure 8 below. Image: Public domain via Wikimedia Commons.



Figure 6. A caiman does its “water dance” (Vliet, 1989) that looks like boiling water. Image: Wikimedia Commons. Credit: berniedup. License: <https://creativecommons.org/licenses/by-sa/2.0/deed.en>.

tissues bind them to one another and to layered tissues above and below them. A 2021 report of newfound *Sarcosuchus* re-

mains described its scutes as deeply pitted (Mohler, McDonald, and Wolfe, 2021). Figure 4 here reproduces their Figure 1.

Each of the many pits that riddle the scutes anchored a cord of connective tissue. Pit depth and density are characteristic (and even diagnostic) of *Deinosuchus* and indicate their robust connectivity. This feature gave *Deinosuchus* perhaps the thickest scales of any creature. Given that thicker plus more connective cords increase the strength (or tightness) of attachment, this observation matches the three-verse (41:15–17) emphasis that God gives to Leviathan’s “tightly” (41:17) sealed scales. Figure 5 presents a reconstruction of *Deinosuchus*’ five rows of dorsal dermal scales. Modern crocodiles of course have rows of skin scales, but these “rows of scales are his pride” (41:15). These thick scutes and their robust roots help explain the leviathan’s unique ability to deflect harpoons, spears, darts, arrows, and swords.

As alligatoroids with the anatomy to spin in a death roll, it stands to reason that *Deinosuchus* may have exhibited other modern alligator-like behaviors. “In males, the alligator then visibly tenses and produces an infrasonic signal so powerful that water ‘dances’ up around the alligator’s torso” (Vliet, 1989). Figure 6 illustrates this behavior as a male caiman (*Caiman yacare*), poised with its back just beneath the surface, vibrates its chest cavity at just the right frequency to produce bubbling jets of water to impress a nearby female. The words, “He makes the deep boil like a pot” (Job 41:31a) accurately describes this unique behavior.

At this point the objection could be raised that it is inconsistent to treat the text’s description of fire as strictly literal and its use of “boiling” as metaphorical. However, the Hiphil stem of (“boil”), means “to cause to boil.” It thus may not require that heat be the cause of the bubbling. Taken this way, “boil” would be just as literal as “fire” here.

In addition to its uniquely robust dorsal scutes and potential for “water dance” behavior, *Deinosuchus* had an enlarged chamber at the tip of its snout. “The

reason for its enlarged nose is unknown” (Cossette and Brochu, 2020). Figure 7 shows this snout bulb of unknown function. *Deinosuchus*’ breathing nostrils were positioned above its eyes.

Possibly this extra and mysterious hollow space within the skull of (so far, only) *Deinosuchus* housed a fire-producing organ. This may sound far-fetched to us who have never seen such a thing, but so might those feel about animals that generate sonic fields (bats, dolphins), electric fields (eels and fish), and electromagnetic fields (fish, squid, scores of other marine animals, fungus, and fireflies) who had never seen those animals. These biological wonders, especially including the bombardier beetle’s steam blast organ, prove the adequacy of the creative genius of Leviathan’s Maker to have been well capable of constructing a fire-emitting organ.

Further, extra holes accessed its snout bulb. “In each premaxilla there is a large fenestra [opening] lateral to the external narial opening [nostril]—a distinctive feature not seen in any other known crocodylian (Cossette and Brochu, 2020).” It certainly used its dorsal nostrils for respiration, so how did it use the extra holes in the front of its snout? “We do not know what they were for” (Cossette and Brochu, 2020). Figure 8 shows a *Deinosuchus* skull replica manufactured after the representation shown in Figure 5 was made. As such, it includes the two mysterious anterior fenestrae that recent research has revealed.

These extra snout holes lead to unique, specialized chambers. Could those chambers have housed a fire-producing organ, and were these holes the “nostrils” out of which “smoke goes” (Job 41:20)? Whereas fossils do not supply direct answers to soft-tissue anatomy questions, bone anatomy provides indirect context for soft-organ possibilities.

God’s choice to emphasize largely subjective reactions and responses to Leviathan rather than the animal’s detailed anatomy leave us with precious few



Figure 7. *Deinosuchus* snout bulb presumably had some biological function. This replica does not show its two anterior holes as does the updated and more anatomically accurate replica seen in Figure 8.

clues to compose a picture that might match an animal. Similarly, nobody yet knows what new fossil remains might be discovered that present an even better match to those clues than *Deinosuchus*. Although these admitted shortcomings keep absolute confidence in identification out of reach, enough details from both Scripture and fossils permit a defensible identification. All told, it is difficult to find an anatomical or inferred behavioral feature—including play—in *Deinosuchus* that contradicts any detail of Job’s leviathan.

Where Could Leviathan Have Come From?

At this point, some comments on the contextualization of such an animal within Biblical history seem in order. If indeed Job knew a *Deinosuchus* or

similarly large amphibious reptile after the Flood, then how might its ancestors have survived that Flood which Scripture teaches was universally destructive? Details from fossils and Scripture help constrain possibilities.

Genesis seven specifies that the animals that boarded Noah’s ark lived “on the face of all the earth” (Genesis 7: 3). The result was that “all flesh died that moved on the earth” (Genesis 7:21), but not the flesh that moved in the seas. The fossil creatures under consideration associate with marine deposits of the Zuni Megasequence—the high-water mark of the Flood (Clarey, 2020). For example, The Aguja Formation which contains the largest *Deinosuchus* specimens and outcrops in Big Bend, TX, and northern Mexico holds mixed fossil beds that include remains of tropical plants, crocodiles,



Figure 8. *Deinosuchus riograndensis* skull replica shows the two mysterious extra openings at the front of its snout
Image: Bullock Museum, photo by Jenny Cobb, Associate Curator of Exhibitions.

lizards, dinosaurs, turtles, fishes, bird-like forms (Weishempel, 2004), and notably sharks, skates, and ammonites that indicate marine mixing.

Fully aquatic fauna like chondrichthyans, osteichthyans, and ammonites did not board the Ark. Just as clearly, fully terrestrial fauna like lizards (“creeping things”) and birds boarded the Ark. However, amphibious fauna like crocodylians, certain dinosaurs, and trionychidae (soft-shelled turtles) would have stayed outside the Ark if their physiologies could not withstand a year of dry surroundings. We suspect it was unlikely for Noah’s family to have maintained wet “rooms in the ark” (Genesis 6:14). Thus, many amphibious fauna probably endured the turbulent Floodwaters.

While either Ark-bound or seagoing options could be argued for our leviathan candidates, present considerations lead to the latter option.

If *Deinosuchus* survived the Flood outside the Ark, that would fit fine with Scripture, but would it fit stratigraphy? In our progressive Flood model, fossil order reflects the Floodwaters inundating sea floor first, then near-shore, then lowlands, and uplands last, all within the first half of the Flood year (Tomkins and Clarey, 2023). In this context, leviathan candidates would have been inundated with lowlands (wetlands) ecology plus its marine mix. Subsequent weeks would see Flood tsunamis deposit higher percentages of terrestrial flora and fauna from upland ecologies on top of Zuni strata in some locations. The progressive Flood thus sketches a rationale for the presence of dinosaurs and *Deinosuchus* in lowland deposits and their absence from upland deposits.

Theological Implications for a Real Leviathan

The matching features between *Deinosuchus* and Job’s leviathan, especially the creature’s recently discerned snout morphology, seem at this point difficult to refute. The exegete thus has less reason now than in prior centuries to interpret the leviathan as anything other than a real animal. Therefore, we now ask what difference it might make to insert or imagine some creature like *Deinosuchus* into this particular narrative. We find two ways that a literal leviathan underscores the development of Job’s theology and by extension the development of theology for those who read Job.

First, the Lord takes clear and full responsibility for every fearsome and immense feature of this enormous animal. He even calls attention to the leviathan’s “terrible teeth” (41:14). What business does a God of mercy, grace, and lovingkindness have with pointing out this

animal’s horrors? Part of the answer must derive from the crescendo seen within God’s overall interrogative.

The Lord’s menagerie includes descriptions of untamable animals. He surveys wild goats, horses, the ostrich, and other birds. Job’s response to all this is essentially to admit that he spoke out of turn. But it appears that God was not yet satisfied with such a response, since He continued his discourse. If behemoth, as the penultimate animal in the list, indeed referred to a sauropod, then God was pointing to the largest land animal ever created. This lesson finds its basis in the principle of causality where an effect is never greater than its cause. As the One who made behemoth, the Lord must therefore be even greater than this giant animal.

Finally, this leviathan with its terrible teeth, impenetrable hide, and biological flame thrower gets a longer description than any of the prior thirteen animals—and yet this is by far the most monstrous! Only after God took full credit for this creature did Job actually and finally repent. This response appears to have pleased the Lord since He ceased His discourse at that point.

What was it about the leviathan that made such an impact on Job? If God has definite purposes for the leviathan’s terrible teeth, then He has definite purposes for Job’s terrible trials. If the Creator can approach this fantastic fiend that no man can approach, then this same Creator can approach the wrecked ruins of Job’s life that are unapproachably painful.

In short, by taking full responsibility for all the features and harmful effects of a real and horrendous water monster, the Lord seems to have convinced Job that He can take full responsibility for all the awful features of our sinful souls and harmful effects of others’ unjust treatment of us. This lesson that God can use the worst circumstances for his ultimately good and everlasting purposes hinges on leviathan being more than a

myth or metaphor, but on being a real animal.

A second theological difference in identifying Job's leviathan as a real animal harkens to Job's own use of the word. As noted above, Job used "leviathan" as a metaphor for the abject hopelessness of his life. By pointing out that indeed "any hope of [you humans] approaching him is false" (41:9) but that God can handle him just fine, the Lord reassures Job that even though his life looks hopeless, God can handle his life just fine, too.

Moreover, the Lord chose to use the same animal that Job had referenced during his first lament. Whereas Job pointed to the leviathan as a picture of ultimate sorrow, the Lord picked up that same animal as a picture of His divine oversight. Did Job recognize the Lord's repurposing of Job's reference to a leviathan? If so, he must also have recognized the simple fact that God was listening. He was there all along, caring for Job and allowing the accuser's plans and Job's extreme suffering to produce the outcomes that the Lord was after—for example Job's repentance and restoration of fellowship with his Maker, "for the Lord had accepted Job" (42:9).

Conclusion

In His discourse to Job, God points out 14 animals that He created to show His might and purposefulness. The last two creatures are behemoth and leviathan. The context treats these as animals, as does one of four other references to "leviathan" in Scripture. However, no living animal exactly matches the characteristics listed in Job 41, making interpretation difficult.

Biblical Creation aids interpretation by placing most rock and fossil formation after sin, during Noah's Flood. This makes some animals that have gone extinct today available as candidates for the leviathan. *Deinosuchus* stands out as having had an anatomy that aligns with

the Biblical text more closely than previously described candidates. In contrast with *Sarcosuchus*, it was larger and had the tail anatomy required to perform a death roll that matches Job 41:31b. In contrast with *Spinosaurus*, it again had the anatomy for a death roll, and it did not have the bony dorsal sail that would have kept it from spinning underwater. In addition, *Deinosuchus* had unique and recently discovered snout features that could have housed a fire-producing organ. Although future paleontological discoveries may uncover a creature with an even tighter fit to Job 41, *Deinosuchus* violates none of the leviathan's anatomy or behavior described therein.

This real creature placed in Job 41 validates the context of actual animals and clarifies some theological significance of God's message for Job. Namely, Job may well have reasoned that if He had a purpose for the leviathan's terrible teeth, then He has a purpose for Job's terrible circumstances. An actual matching animal substantiates a literal leviathan that helped in Job's repentance and restoration with the Lord.

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Chloroplast Genome-Based Baraminology Study of Liliales

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Abstract

The mitochondrial DNA has been used widely in molecular baraminology studies. Besides the mitochondrion, the chloroplasts of plants harbor an entire organelle genome, which can also be used to identify putative groups, which can be compared to those identified in studies based on mitochondrial DNA, nuclear DNA, and morphological characters. The ten-fold size of the chloroplast genome allows a much larger sequence space to be analyzed, but it also brings its own set of analytical challenges to the table.

In this study, the chloroplast genomes of 163 species from the plant order Liliales were examined, with the genus *Stemona* (order Pandanales) as an outgroup. A multiple alignment was created, and a sequence similarity matrix was derived from it, which was then clustered into several putative holobaramins. Of these, six groups had more than five members. These putative baramins are: *Tulipa*+*Amana*, *Disporum*, *Fritillaria*+*Lilium*+*Nomocharis*+*Notholirion*, *Daiswa*+*Paris*+*Trillium*, *Smilax*, and *Veratrum*.

Compared to the results of a previous morphological analysis, there are some discordances. The previous analysis separates *Trillium* from *Daiswa* and *Paris*, and unites *Alstroemeria* with *Disporum*. Ultimately, genetics should decide baraminic classification, albeit the chloroplast genome still makes up only a small fragment of the entire plant genome. Following this study, it is hoped that chloroplast genome analysis may enrich the toolkit of molecular baraminology.

Key Words: Amana, chloroplast DNA, Disporum, Fritillaria, molecular baraminology, Liliales, organelle DNA, Paris, Tulipa, Veratrum

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Introduction

Organelle genomes are useful in analyzing species relationships via sequence similarities. Their small size makes them easy to sequence, and occur abundantly in cells. Mitochondrial DNA also do not undergo the kind of genetic recombination that nuclear genes do. However, their short length limits the kind of conclusions that we can draw from using them in organelle DNA studies.

Mitochondrial DNA (mtDNA) have been widely used in molecular baraminology studies for decades. Some mtDNA studies have been performed in turtles (Robinson et al., 1997), cats, dogs, and horses (Wood, 2013). Cserhati analyzed mtDNA in bats (Cserhati, 2021), cephalopods (O’Micks, 2018), birds (Cserhati and Alquist, 2019), primates (Cserhati, 2022), and pinnipeds (Cserhati and Moynagh, 2022).

Chloroplast studies, on the other hand, are almost non-existent in the molecular baraminology literature. Wood and Cavanaugh (2001) studied the relationships between eleven species of *Flaveria* (yellowtops), and found that C3, C4, and C3-C4 species segregate into separate monobaramins, based on the sequence similarity of the H subunit of the glycine carboxylase system gene (*gcsH*). Furthermore, the sequence similarity of the NADH dehydrogenase gene (*ndhF*) calculated by Kim and Jansen (1995) for the family Asteraceae was used by Wood and Cavanaugh to assess baraminic relationships within the subtribe Flaveriinae and other groups within Asteraceae.

However, no such genome analysis has been carried out on chloroplast genomes for a large number of plant species. Compared to the mitochondrial genome, the chloroplast genome is much longer, around 150 Kbp. It contains 100–150 coding sequences, genes, rRNAs and tRNAs, compared to the 37 of the mtDNA. It is made up of four genomic regions, two inverted repeats (IR), a large and a small single

copy (LSC, SSC), and a small copy region (SCR). This makes it harder to align these longer sequences, so alternative alignment software, such as MAFFT may be used as opposed to ClustalW or ClustalO. Furthermore, chloroplast DNA also undergoes recombination. On the other hand, since plant cells also contain mitochondria, it may be possible to supplement chloroplast studies with mitochondrial and also morphological studies.

In this study, my goal is to study the sequence similarity between plants in the order Liliales (lilies). Lilies are monocotyledonous flowering plants and are angiosperms. It is made up of 10 families, 67 genera and 1,768 species. They are characterized by a bulbous rhizome and six alternating tepals. Similar to mtDNA studies, I aim to determine baraminic relationships by clustering these 163 species based on global chloroplast genome sequence similarity.

Materials and Methods

Sequence data

The chloroplast genomes of 165 species from Liliales were downloaded from the NCBI Organelle Genome Browser at <https://www.ncbi.nlm.nih.gov/genome/browse#!/organelles>. Four chloroplast genomes from the genus *Stemona* (order Pandanales) were also downloaded as outlier species. Outgroups may be used in baraminology studies to compare the organisms under study to a group that can reasonably be identified as a separate holobaramin. If clusters are found in the data set under analysis that are comparable to the outgroup holobaramin, then that supports the conclusions drawn from the study. A list of species that were studied can be found in Supplementary File 1. *Disporum bodinieri* and *Lilium souliei* were removed because their sequence origin was irregular compared to all other sequences (which began with the

gene *psbA*). Since generally the level of the holobaramin is the family, the order Liliales was chosen, making it likely to find multiple holobaramins within this larger taxonomic group.

Software

The sequence aligner software MAFFT (Katoh and Standley, 2014) was used because it can align longer sequences compared to mtDNA. Its high speed is also desirable. MAFFT was run on the chloroplast genomes with default parameters.

The Calinski-Harabasz index (Ujjwal and Sanghamitra, 2002) was calculated to help determine the optimal number of baramins in the sequence similarity matrix using the *cascadeKM* command from the ‘vegan’ package.

Baraminic heatmaps were created using R, version 4.1.0 using the *heatmap* command, and clusters were determined with the ‘single’ method. The results of clustering and group statistics are also available in Supplementary File 1.

Baraminic trees were drawn for three putative clusters (assumed to be holobaramins) in Figures 2–4 using the WPGMA (weighted pair group method with arithmetic mean) method. For this the ‘wpgma’ command was used in R with default parameters. The linkage clustering method used by the *wpgma* command is ‘average.’ In average linkage clustering, the distance between two clusters is equal to the average of all of the distances between all pairs of entities in the two clusters. WPGMA was preferred over UPGMA, since UPGMA assumes a uniform base pair substitution rate (Göker, 2011).

The elbow, silhouette, and Calinski-Harabasz values for 1–20 clusters can be found in Supplementary File 2. The Organelle DNA Lineages (ODL) software was used to generate chloroplast genome maps for *Veratrum* species as well as *Xerophyllum tanax*. All supplementary files are available on Zenodo at https://zenodo.org/record/7686930#.Y_7fzh_MLrc.

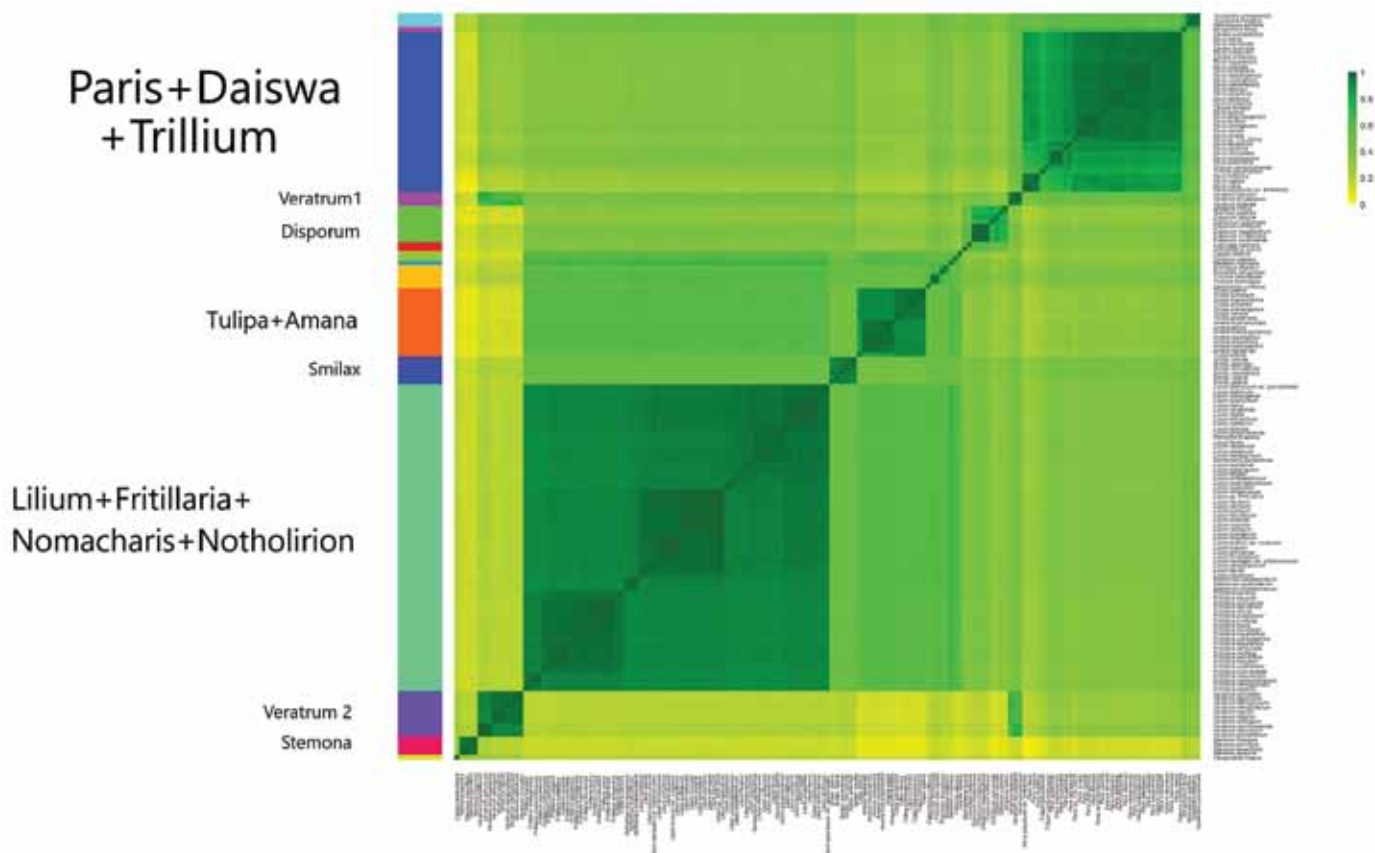


Figure 1. Heatmap showing tentative baraminic relationships between 163 Lilales species. Dark green areas represent higher sequence similarity between the *clp* genomes of species within the same baramin. Yellow colors denote lower sequence similarity between species from two different baramins.

See the end of the paper for a description of each of the supplementary files.

Determination of species clusters as possible holobaramins

The fundamental tenet of baraminology (FTB) states that there exists significant discontinuity between baramins, and significant continuity within baramins. As such, Student's *t*-test *p*-values were used to determine the statistical significance of the tentative species clusters resulting from the cluster analysis. For each cluster, two sets of sequence similarity values were analyzed using Student's *t*-test. The first set of values comes from sequence comparisons between the species in a given cluster. The second set of values

comes from comparing sequences in the cluster versus all other species used in the analysis. Therefore, the *p*-value unites the statistical significance of both outward dissimilarity (discontinuity) and inward similarity (continuity), as required by the FTB.

Biblical Analysis

Lilies are mentioned 17 times in the Bible (1 Kings 7:19, 22, 26; 2 Chronicles 4:5; Psalm 45:1, 60:1, 69:1, 80:1; Song 2:1–2, 16, 4:5, 5:13, 6:2–3, 7:2; Hosea 14:5; Matthew 6:28; Luke 12:27). Together with all land plants, they were created on Day 3 of Creation Week (Genesis 1:11–12).

Most of these verses involve poetic descriptions of lilies, describing how their shape and vivid coloration exceeds the glory of even the greatest kings (Luke 12:27). However, the Bible doesn't let us draw any conclusions about how lilies are grouped or subdivided.

Song 2:1 appears to compare lilies to roses: "I am the rose of Sharon, and the lily of the valleys." However, this is only a poetic comparison, and not much can be concluded from it. Song 2:2 says this: "Like a lily among thorns, So is my love among the daughters." This seems to suggest a discontinuity between lilies and thorny plants, such as roses. Thus, we can say that lilies and thorny plants (such as roses) belong to separate baramins.

Morphology-Based Baraminology Analyses of Liliales

Wood (2008) performed morphology-based baraminology analysis using the BDIST software on three data sets from three families of Liliales: Alstroemeriaceae, Pontederiaceae, and Trilliaceae. Of these, the first and the third analysis is of interest to this study.

Wood found continuity between the genera *Luzuriaga*, *Uvularia*, *Disporum*, and *Dioscorea*. These four genera showed discontinuity with species from two other genera, namely *Alstroemeria* and *Bomarea*, which showed continuity between themselves. This corresponds to two holobaramins within Alstroemeriaceae.

Wood found evidence for two more holobaramins within the family Trilliaceae. These two holobaramins show continuity within themselves and discontinuity between each other. The first holobaramin is made up of almost exclusively of species from the genus *Trillidium*, plus the species *Pseudotrillium rivale*. The second holobaramin is made up of species from *Paris*, *Kinugasa*, and *Daiswa*.

Results and Discussion

The heatmap showing the baraminic relationships between the 163 species can be seen in Figure 1. The Hopkins clustering statistic is 0.965, which reflects extremely good clustering. The Elbow plot in Supplementary Figure 1 is a bit difficult to interpret. The total within sum of squares (twss) value drops very shallowly from three to four clusters: from 30.64 to 30.18, which is a difference of only 1.5%. However, from four to five clusters, the twss value drops to 11.03, but then rises again to 16.49 for six clusters. Afterward, the twss value rises and falls, making it hard to discern the optimal number of clusters.

The Silhouette plot in Supplementary Figure 2 also shows a similar difficulty

in determining the optimal number of clusters in the data, as the maximum Silhouette value varies widely.

On the other hand, the Calinski-Harabasz index (depicted in Supplementary Figure 3) presented a clearer picture, showing an optimal 16 clusters with a Calinski-Harabasz index of 969.2. All 16 of these putative baramins have a statistically significant p-value.

These 16 clusters were examined more closely. The first cluster is made up of only two species, an *Alstroemeria* hybrid and *Luzuriaga radicans*. This contradicts the morphological evidence of Wood (2008) who separates *Alstroemeria* and *Luzuriaga*. In this study, these two species do not provide solid enough evidence to join these two genera together into a single holobaramin.

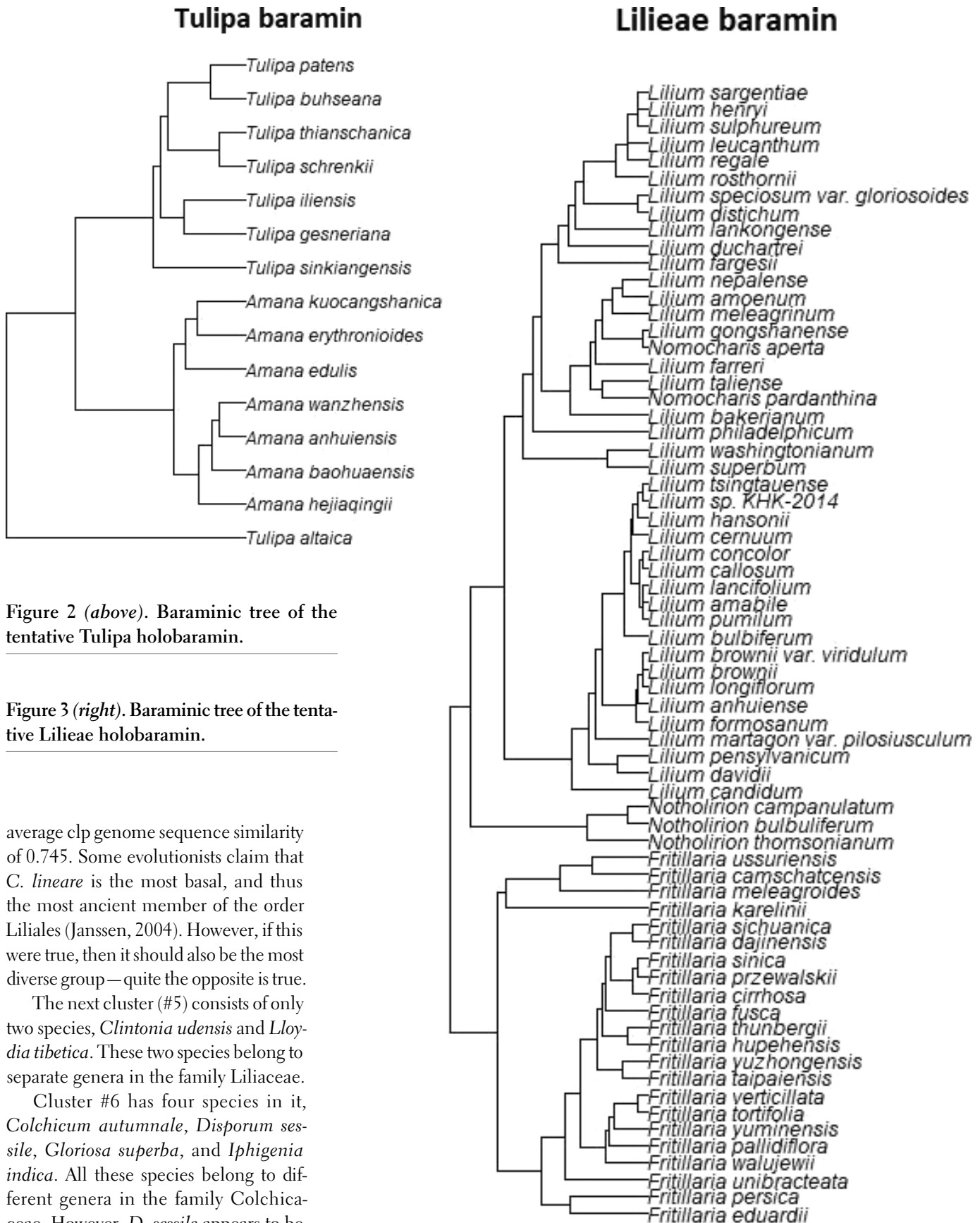
The second cluster is made up of 15 species from the two genera *Amana* and *Tulipa*, two genera from the family Liliaceae. Both of these groups are known as tulips, *Amana* species being known as East Asian tulips (Li et al., 2017). Several authors even place *Amana* within *Tulipa* (Liang, 1995). Other studies place *Amana* and *Tulipa*, as well as the genus *Erythronium* into a monophyletic group (Kim et al., 2013). Compared to *Tulipa*, *Amana* has lost the *infA* gene (translation initiation factor 1), and its *rps19* gene lies entirely within the LSC region in *Amana edulis*, as opposed to *Tulipa* species where *rps19* lies on the boundary between the LSC and the IRb. Furthermore, the *ndhF* gene lies entirely within the SSC region in *A. edulis*, whereas it transverses the IRb/SSC boundary (see Figure 2 in Li et al., 2021).

A baraminic tree showing species from *Tulipa* and *Amana* can be seen in Figure 2. *T. patens*, *T. thianschanica*, *T. schrenkii*, *T. iliensis*, *T. gesneriana*, and *T. sinkiangensis* form a visible monobaramin compared to the seven *Amana* species. *T. altaica* is an outlier species compared to the other 14 species. Its *clp* genome length (146,877 bp) is shorter than the average of the other *Tulipa* spe-

cies (151,986 bp) (Zhou et al., 2019). Its GC% is also at 37.1%, compared to the mean value of $36.6 \pm 0.03\%$ ($p = 1.08 \times 10^{-62}$) of all the other species. It also has only 81 coding sequences compared to 87 for all the other *Tulipa* species (with *T. gesneriana* having 85 coding sequences). A list of deletions greater than 100 bp from the *T. altaica clp* genome compared to the other genomes of *Tulipa* can be seen in Table I. Together, these deletions make up 5,566 bp, which makes up 3.8% of the 146,877 bp genome of *T. altaica*. The multiple alignment file is available online as Supplementary File 3. The following 15 genes and rRNA molecules are missing from the *clp* genome of *T. altaica*, which are present in the *clp* genomes of the other *Tulipa* species are listed in Table II. The gene order of the *Tulipa* species can be found in Supplementary File 4.

The third cluster consists of five species: *Calochortus uniflorus*, *Prosartes lanuginosa*, *Scolioopus bigelovii*, *Tricyrtis formosana*, and *Tricyrtis macropoda*. These five species come from three separate families within Liliales, Liliaceae, Colchicaceae, and Melanthiaceae. The placement of these species has been in flux. Various authors have placed *Tricyrtis* as a sister group to *Calochortus*, whereas others have allied it with *Scolioopus* and *Prosartes*. The position of *Tricyrtis* has varied in evolutionary phylogenetic trees based on the *rbcL* and *ndhF* genes, thus highlighting the usefulness of whole genome sequence analysis as opposed to single genes (Patterson and Givnish, 2002).

Cluster #4 consists of a single species, *Campynema lineare* (the green mountain lily), found in Tasmania. This species is the only one that belongs to the genus *Campynema*, which belongs to the family Campynemataceae. Vinnersten and Bremer (2001) report that this family is monophyletic, suggesting that it is a holobaramin. Interestingly, this species is the least similar compared to all the rest of the species, with an



tains four *Disporum* species: *D. cantoniense*, *D. megalanthum*, *D. uniflorum*, and *D. viridescens*. It might be possible to consolidate clusters 6 and 7 into one putative baramin. The clp genomes of all five *Disporum* species were aligned with MAFFT, and it was found that *D. sessile* contains several large indels compared to the other four *Disporum* species. The multiple alignment file is available online as Supplementary File 5. These indels are listed in Table III. The total length of all those indels longer than 50 bp comes up to 5,469 bp, which makes up 3.4% of the 159,102 bp clp genome of *D. sessile*. Whereas *D. sessile* has an average sequence similarity of only 93.7% with the other four *Disporum* species, these other four species have an average sequence similarity of 99.4% among themselves. A large part of the 5.7% difference could be due to these indel sequences. The DNA insertions within the *D. sessile* genome may possibly lead to the formation of a monobaramin within *Disporum*.

The next cluster (#8) is made up of 67 species from the genera *Fritillaria*, *Lilium*, *Nomocharis*, and *Notholirion*. These are all members of the family Liliaceae. These four genera and *Cardocrinum* comprise the tribe Lilieae (Li et al., 2022). Some taxonomies accommodate *Nomocharis* into *Lilium* (Gao and Gao, 2016). The GC% of the species in this study also fits into a narrow range (36.9–37.1%). Figure 3 shows a baraminic tree with species from *Lilium*, *Nomacharis*, *Notholirion*, and *Fritillaria*. The species in this group are characterized karyotypically of two long metacentric chromosomes and ten medium-length telocentric chromosomes (Patterson and Givnish, 2002).

Cluster #9 is made up of three species, *Heloniopsis tubiflora*, *Ypsilandra tibetica*, and *Ypsilandra yunnanensis*. These are two genera from the family Melanthiaceae.

Cluster #10 is made up of a single species, *Medeola virginiana*. It is the

Table I. A list of deletions from the *T. altaica* clp genome compared to the other species of *Tulipa*.

Start position	End position	Deletion length
6167	6476	310
13947	14060	114
29737	29897	161
30209	31056	848
43552	43749	198
44137	44364	228
45956	46349	394
59234	59583	350
64825	65359	535
66671	67559	889
110019	110440	422
112854	113970	1117

Table II. List of genes and rRNA molecules missing from the *T. altaica* clp genome compared to the other *Tulipa* species.

Gene name/function
ATP-dependent Clp protease proteolytic subunit
acetyl-CoA carboxylase carboxyltransferase beta subunit
chloroplast envelope membrane protein
cytochrome c heme attachment protein
hypothetical chloroplast RF19
hypothetical protein RF1
hypothetical protein RF2
hypothetical protein RF68
NADH-plastoquinone oxidoreductase subunit 7
PetG
photosystem II CP43 chlorophyll apoprotein
photosystem I subunit IX
ribosomal protein L32
RNA polymerase beta'' subunit
Ycf3

only species in its genus, *Medeola*. It belongs to the family Liliaceae.

Cluster #11 is made up of 35 species, two from the genus *Trillium*, four from *Daiswa*, and 29 from *Paris*. Whereas Wood (2008) assigned *Paris* and *Daiswa* into the same holobaramin, he found that *Trillium* forms its own holobaramin.

Chloroplast genome analysis performed by Huang et al. (2016) shows that the genus *Paris* can be split up into two segregate genera, namely *Paris* and *Daiswa*. Jiang et al. (2022) also found that several species from *Trillium* and *Paris* intermingle with one another. Furthermore, several species from *Paris* and *Trillium* have a genome size 1C greater than 100 Gb, with *P. japonica* having the largest known eukaryotic genome at around 150 Gbp (Yang et al., 2019).

The baraminic tree in Figure 4 shows four *Daiswa* species intermingling with species from the genus *Paris*. Besides this, *Daiswa* and *Trillium* are sister taxa, implying that *Trillium* could be included in the *Paris*+*Daiswa*+*Trillium* = Parideae tribe/holobaramin. In the clp genome sequence similarity matrix *T. camtschaticense* and *T. govanianum* have a sequence similarity of 92.4%. A bit surprisingly, they have an average sequence similarity of 92.8% with species from *Paris* and *Daiswa*. This implies that *Trillium* is part of the Parideae holobaramin.

Do et al. (2014) suggest that the chloroplast envelope membrane protein A (*cemA*) gene may be used as a molecular taxonomic marker to identify species from Paridae. They base this on the divergent protein sequence after the first four amino acids. This gene has apparently undergone pseudogenization due to stop codons in its amino acid sequence.

Cluster #12 is made up of six species from the genus *Smilax*, in the family Smilacaceae. These are *Smilax glabra*, *S. goeringii*, *S. microphylla*, *S. moranensis*, *S. riparia*, and *S. weniata*.

Table III. A list of indels ≥ 50 bp between *Disporum sessile* and other *Disporum* species in a multiple alignment of their clp genomes.

Start pos. in alignment	Length of indel	Insertion (ins) or deletion (del)
1	164	Ins
6096	54	Ins
6844	366	Del
8866	149	Ins
30297	119	Del
31528	125	Del
32528	434	Del
33365	73	Del
47605	56	Ins
48670	143	Ins
50104	79	Del
53089	89	Del
59164	106	Ins
59617	51	Ins
66571	54	Del
67716	157	Ins
96781	616	Del
114518	1727	Ins
118877	50	Ins
119887	61	Ins
133685	180	Ins
152308	616	Del

The next two clusters, #13 and #14 are a special case. Zhang et al. (2021) also found that the genus *Veratrum* is monophyletic based on a study of the genes and intergenic regions of 10 *Veratrum* species. Here the 13 species from the genus *Veratrum* are split into two groups, which show up separate clusters on the baraminic heatmap in Figure 1. The first group, cluster #13 contains ten species: *Veratrum dahuricum*, *V. grandiflorum*, *V. japonicum*, *V. maackii*, *V. mengtzeanum*, *V. nanchuanense*, *V. nigrum*, *V. oblongum*, *V. schindleri*,

and *V. stenophyllum*. The three species from cluster #14 are *V. oxyspalum*, *V. patulum*, and *V. taliense*. The mean sequence similarity between these two groups is $90 \pm 1.1\%$. Within cluster #13 this is $97.8 \pm 1.7\%$. Within cluster #14 this value is $97.9 \pm 1.2\%$.

What is the cause of this disparity in sequence similarity? Does it mean that there are two *Veratrum* holobaramins? Or could there be an underlying genetic reason for this difference? It could be possible that since the chloroplast genome is approximately ten times

Parideae baramin

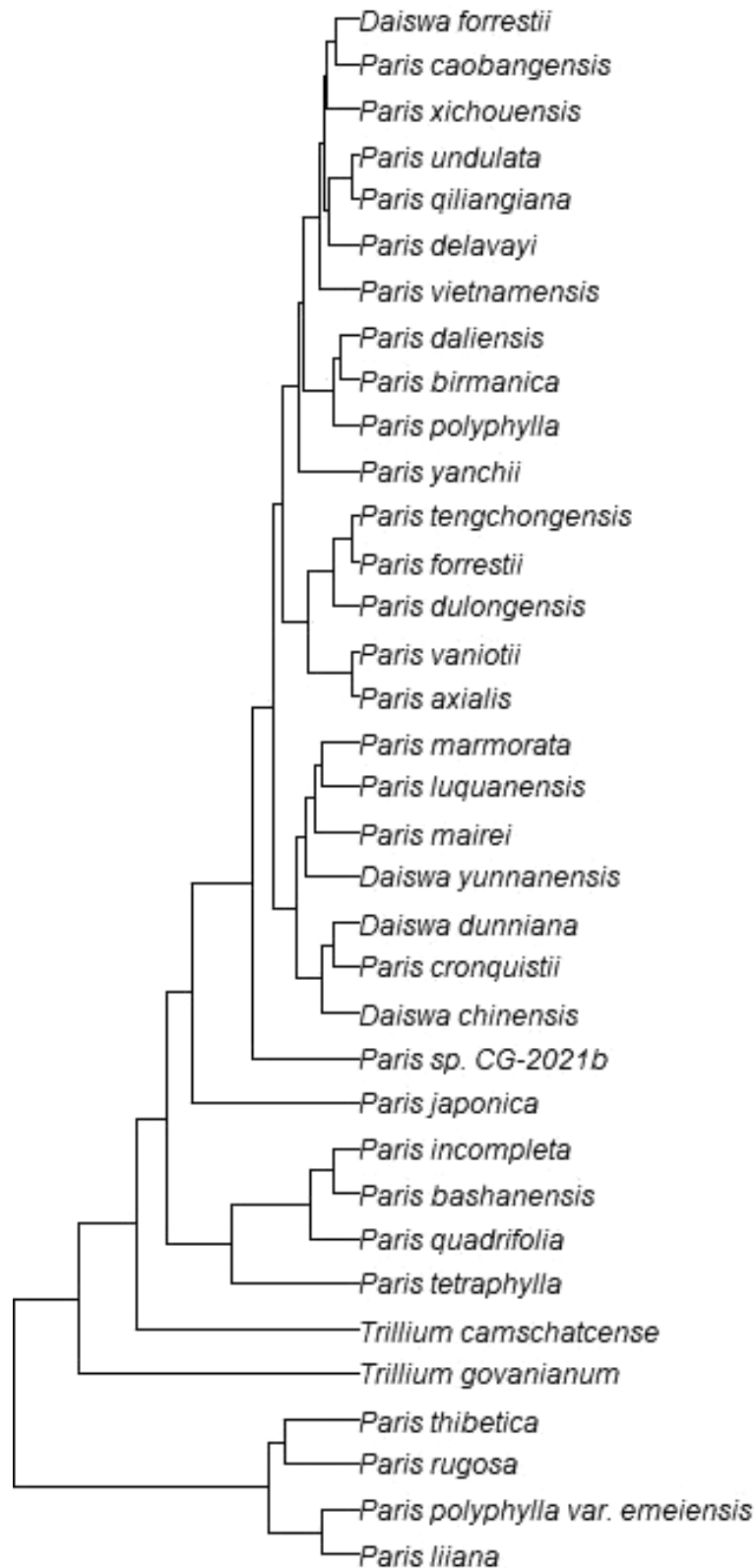


Figure 4. Baraminic tree of the tentative *Parideae* holobaramin.

larger than the mitochondrial genome, in a geometric sense this allows for more mutations, such as insertions, deletions, and inversions to occur. This we have already seen in the case of the five *Disporum* species. Indeed, a 17,608 bp inversion was found in the genomes of cluster #13. This inversion was also discovered by Chen et al. (2021) in the chloroplast genome of *V. oxysepalum*, which they found clustered the closest to *V. patulum*. This inversion encompasses 13 genes: *NdhF*, *RPL32*, *tRNA-Leu*, *CcsA*, *NdhD*, *PsaC*, *NdhE*, *NdhG*, *NdhI*, *NdhA*, *NdhH*, *RPS15*, and *Ycf1*. See Supplementary File 6 to view the gene orders of these 13 *Veratrum* species as well as *Xerophyllum tenax*, an outlier. Figure 5 displays the *clp* genomes of the 14 *Veratrum* species as well as the genome of *X. tenax* for comparison.

When did this large-scale inversion happen? Did this inversion affect the smaller group, meaning that they are a younger group? Or vice versa? The order of the 13 genes is the same between *X. tenax* and the species from cluster #14. Thus, the inversion predates the formation of the ten species in cluster #13. Interestingly, the loss of *rps16* exon 2 is characteristic of *Veratrum* species compared to all other members of Liliales (Do et al., 2013).

This large-scale inversion of this segment of the DNA could have led to a speciation event, leading to the formation of two monobaramins. Since the inversion event affected 13 genes (9.6% of the 135 genes in the genomes of species from the *Veratrum* genus), these genes may have become dysregulated.

Cluster #15 is made up of a single species, *X. tenax*. It belongs to the genus *Xerophyllum*, which belongs to the family Melanthiaceae.

Lastly, cluster #16 is made up of the four outlier species from the genus *Stemona*. This genus belongs to the order Pandanales.

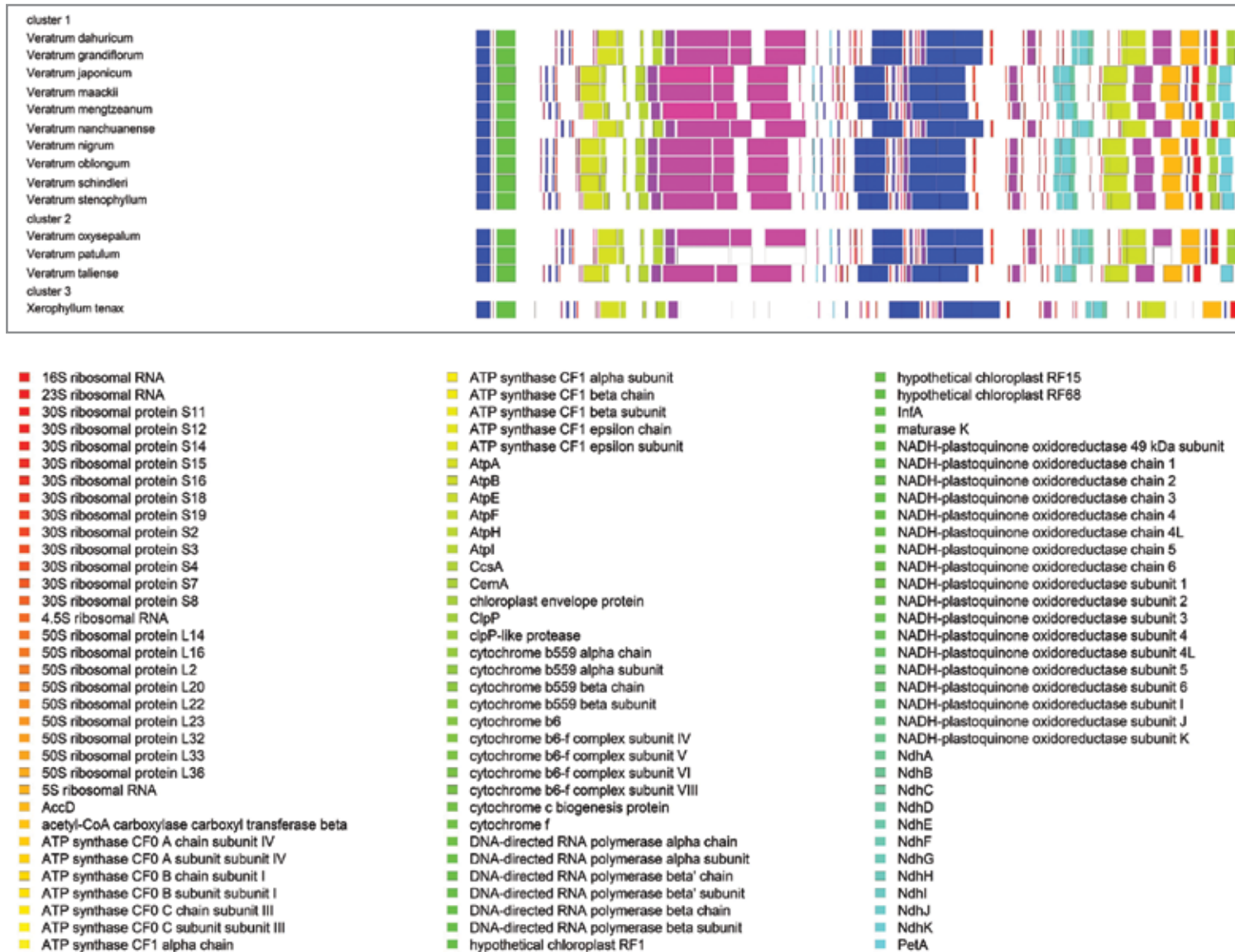


Figure 5. Gene order map of the chloroplast genomes of 13 *Veratrum* species and *Xerophyllum tenax* (outlier). *V. oxyssepalum*, *V. patulum*, and *V. taliense* form a small group separate from the other ten species. The red line denotes the large-scale inversion of 17,608 bp.

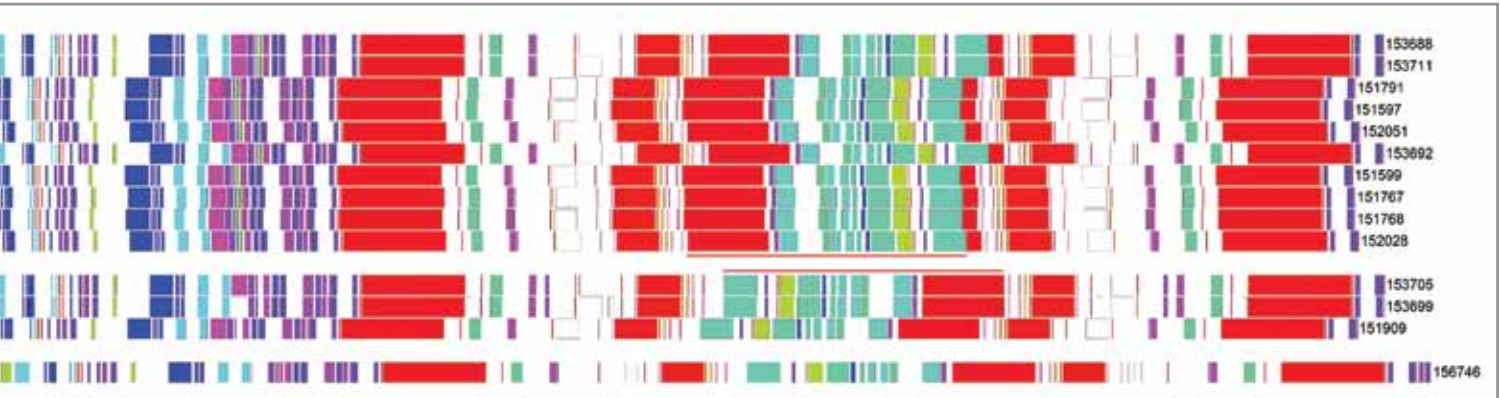
Summary and Conclusion

This is the first molecular baraminology study that involves the analysis of the entire chloroplast genome. While there was no mitochondrial data available for these Liliales species, the present results were comparable with a previously made morphological analysis. Whereas Wood unified *Alstromeria* and *Dispo-*

rum, the molecular evidence splits them into two separate groups, while putting together *Luzuriaga* and *Alstromeria*. Conversely, molecular evidence unifies *Daiswa*, *Paris*, and *Trillium*, whereas morphological evidence separates *Trillium* from the other two. Although the groups found here are tentative, if they coincide with the results from other

studies, that may strengthen their status as a holobaramin.

Table IV shows the similarities and differences in baraminic classification in 42 species from these six genera between the molecular and the morphological study. It may be that further study is needed, especially since the chloroplast genome makes up only a small fraction



- | | | |
|---|---|--|
| <ul style="list-style-type: none"> PetB PetD PetG PetL PetN photosystem I assembly protein Ycf3 photosystem I assembly protein ycf4 photosystem I assembly protein Ycf4 photosystem I iron-sulfur center subunit VII photosystem I P700 chlorophyll A apoprotein A1 photosystem I P700 chlorophyll A apoprotein A2 photosystem I reaction center subunit IX photosystem I reaction center subunit VIII photosystem II 10 kDa phosphoprotein photosystem II 44 kDa apoprotein (P6) photosystem II D2 protein photosystem II p680 chlorophyll A apoprotein photosystem II p680 chlorophyll A apoprotein (CP-47) photosystem II protein I photosystem II protein J photosystem II protein K photosystem II protein L photosystem II protein M photosystem II protein N photosystem II protein T photosystem II protein Z photosystem II Q(b) protein (D1) PsaA PsaB PsaC PsaI PsaJ PsbA PsbB | <ul style="list-style-type: none"> PsbC PsbD PsbE PsbF PsbH PsbI PsbJ PsbK PsbL PsbM PsbN PsbT PsbZ ribosomal protein L14 ribosomal protein L16 ribosomal protein L2 ribosomal protein L20 ribosomal protein L22 ribosomal protein L23 ribosomal protein L32 ribosomal protein L33 ribosomal protein L36 ribosomal protein S11 ribosomal protein S12 ribosomal protein S14 ribosomal protein S15 ribosomal protein S18 ribosomal protein S19 ribosomal protein S2 ribosomal protein S3 ribosomal protein S4 ribosomal protein S7 ribosomal protein S8 ribulose-1,5-bisphosphate carboxylase/oxygenase large subunit | <ul style="list-style-type: none"> ribulose biphosphate carboxylase large chain RNA polymerase alpha subunit RNA polymerase beta' subunit RNA polymerase beta subunit RNA polymerase beta subunit RpoA RpoB RpoC1 RpoC2 translation initiation factor IF-1 tRNA-Ala tRNA-Arg tRNA-Asn tRNA-Asp tRNA-Cys tRNA-Gln tRNA-Glu tRNA-Gly tRNA-His tRNA-Ile tRNA-Leu tRNA-Lys tRNA-Met tRNA-Phe tRNA-Pro tRNA-Ser tRNA-Thr tRNA-Trp tRNA-Tyr tRNA-Val Ycf1 Ycf2 Ycf3 Ycf4 |
|---|---|--|

of the genome, similar to the mtDNA. However, since the genetic evidence is primary compared to the morphological data, the results drawn from the molecular analysis should be given prominence. Since the chloroplast genome is longer than the mtDNA, geometrically it offers a larger surface for mutations to occur in. Even though a longer

sequence makes more robust analysis possible, mutations, such as insertions and deletions make the picture more complex. These kinds of mutations may possibly lead to speciation events and the formation of new monobaramins. As in the case of *Disporum*, *Tulipa*, and *Veratrum*, insertions, deletions, and large-scale inversions decreased the sequence

similarity between species. This means that further detailed analysis might be needed to clarify baraminic relationships between species. In summary, six groups can be proposed to form holobaramins, each with at least five members. These are *Tulipa*+*Amana*, *Disporum*, *Fritillaria*+*Lilium*+*Nomocharis*+*Notholirion*,

Table IV. Baraminic placement of 42 Liliales species with both an available chloroplast genome sequence, and which were analyzed in the Wood (2008) morphology study.

Species	Sequence similarity classification	Morphological classification
<i>Alstroemeria hybrid</i>	1	A
<i>Luzuriaga radicans</i>	1	B
<i>Disporum sessile</i>	2	A
<i>Disporum cantoniense</i>	2	A
<i>Disporum megalanthum</i>	2	A
<i>Disporum uniflorum</i>	2	A
<i>Disporum viridescens</i>	2	A
<i>Daiswa chinensis</i>	3	C
<i>Daiswa dunniana</i>	3	C
<i>Daiswa forrestii</i>	3	C
<i>Daiswa yunnanensis</i>	3	C
<i>Paris axialis</i>	3	C
<i>Paris bashanensis</i>	3	C
<i>Paris birmanica</i>	3	C
<i>Paris caobangensis</i>	3	C
<i>Paris cronquistii</i>	3	C
<i>Paris daliensis</i>	3	C
<i>Paris delavayi</i>	3	C
<i>Paris dulongensis</i>	3	C
<i>Paris forrestii</i>	3	C
<i>Paris incomplete</i>	3	C
<i>Paris japonica</i>	3	C
<i>Paris liana</i>	3	C
<i>Paris luquanensis</i>	3	C
<i>Paris mairei</i>	3	C
<i>Paris marmorata</i>	3	C
<i>Paris polyphylla</i>	3	C
<i>Paris polyphylla var. emeiensis</i>	3	C
<i>Paris qiliangiana</i>	3	C
<i>Paris quadrifolia</i>	3	C
<i>Paris rugosa</i>	3	C
<i>Paris sp. CG-2021b</i>	3	C
<i>Paris tengchongensis</i>	3	C
<i>Paris tetraphylla</i>	3	C
<i>Paris thibetica</i>	3	C
<i>Paris undulata</i>	3	C
<i>Paris vaniotii</i>	3	C
<i>Paris vietnamensis</i>	3	C
<i>Paris xichouensis</i>	3	C
<i>Paris yanchii</i>	3	C
<i>Trillium camschatcense</i>	3	D
<i>Trillium govianium</i>	3	D

Daiswa+Paris+Trillium, *Smilax*, and *Veratrum*. As of the present writing (February 22, 2023), there are 11,834 chloroplast/plastid genome sequences in the Organelle Genome Browser, which means many chloroplast genome-based molecular baraminology studies can be carried out.

Jeansen (2013) analyzed approximately 2,700 mitochondrial genomes, and found that differences between kinds were due not to random changes since creation, but rather, were due to functional changes in the mtDNA. A similar study could be performed for a large number of chloroplast genomes to discover similar functional changes that may possibly be the basis for differences within plant kinds.

Supplementary Files

Supplementary File 1. Sequence meta-data, sequence similarity matrix, cluster partitioning and cluster statistics of the 165 Liliales species used in this study.

Supplementary File 2. Values from the elbow, silhouette and Calinski plots, seen in Supplementary Figures 1, 2, and 3, respectively.

Supplementary File 3. Multiple alignment of species from the genus *Tulipa*.

Supplementary File 4. Gene order list of species from the genus *Tulipa*.

Supplementary File 5. Multiple alignment of species from the genus *Disporum*.

Supplementary File 6. Gene order list of species from the genus *Veratrum*.

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The CRS of course does not have billions of dollars at its disposal. However, because of some generous donors, we do have the ability to provide some grants to fund investigation of the creation/flood model. If you have an idea for original research that could develop this model—but you need funding for equipment, books, site travel, etc.—we hope you would consider applying for a CRS grant.

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- Only CRS members are eligible to apply.
- The grant amount is \$5000 or less. (Larger requests require extraordinary circumstances.)
- The researcher must agree to submit an article to CRSQ based on the results of the research.

Here is the process:

- Proposals are accepted from January to March each year (see link below for proposal forms).
- Proposal reviews and funding decisions take place in April and May.
- Contracts for funded proposals go out at the start of June.

For more information, please see the CRS website (<https://www.creationresearch.org/vacrc-research-grants>) or scan the QR code to the right. There is also a link on that page if you are interested in donating to help fund more creation research.

Scripture asks, “Who has despised the day of small things” (Zechariah 4:10)? These grants are small compared to the billions available to the NSF, but our prayer is that the Lord take these “small things”—which He enables us to do—and uses them for His glory.



Suggested Strategies for Fitting Precambrian Rocks into Biblical Earth History

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Key Words: Archean impact spherules, discontinuity criteria, lower diluvial boundary, Precambrian, Sudbury impact, upper diluvial boundary, Vredefort impact

Abstract

A comprehensive Flood model requires an appraisal of the rock record. At the global scale, knowing the global volume and distribution of such rock is an important first step. This requires significant mapping and quantifying of rock volume, which in turn requires determining basal and upper diluvial boundaries for each location. An important question in determining basal boundaries is how to address Precambrian sedimentary and volcanic rocks. We present strategies for evaluating such rocks vis a vis the Genesis Flood, concluding that many such rocks should be considered diluvial.

Introduction

A Flood model must be constrained by data. Hydrodynamic and/or sedimentological facets of such models require reliable estimates of the volume and distribution of all sediment deposited by the Biblical Flood. As little as two decades ago, such estimates were rough, but the online availability of modern datasets and developments in mapping software allow more accurate mapping and quantitative analysis.

Determining total global diluvial sediment volume and distribution can

be seen as a two-step process: (1) assessing marine sediment volume and distribution and (2) assessing continental sediment volumes and distributions. Marine sediment volume is currently thought to be $3.37 \times 10^8 \text{ km}^3$ (Reed et al., 2022), and Straume et al. (2019) have developed grids and maps showing distribution. A conservative estimate of the diluvial percentage of that volume is $2.80 \times 10^8 \text{ km}^3$ (Oard et al., 2023). Most of this volume represents sediment eroded from the continents in the Re-

cessive Stage, though it includes some chemical and biochemical rock and even rare coalbeds (Clarey, 2020a). If we assume most is clastic, it equates to an average thickness of 1900 m removed from today's continents at that time (Oard et al., 2023).

The second step is to determine current continental volumes and distributions. This is best done by mapping basal and upper diluvial boundaries and quantifying volume by subtracting the upper from the basal. Uncertainties arise from differing accuracy of the data sets, the volumes of exposed crystalline basement and large volcanic areas, and the volume of sediment reworked after the Flood. Once a terrestrial volume is estimated, the marine volume derived

Table I. Pre-Flood/Flood boundary criteria and proposed boundary location after Austin and Wise (1994) and Wise and Snelling (2006).

Boundary Criterion	Boundary Location
Paleontological Discontinuity	Between rocks with no multi-cellular fossils and rocks with multi-cellular fossils
Erosional Discontinuity	The lowest unconformity with sedimentary rocks or a nonconformity at the contact with crystalline basement
Time Discontinuity	Lowest and most significant time gap
Sedimentary Discontinuity	At the base of the lowest fining upward sequence
Tectonic Discontinuity	At the lowest tectonic event

from diluvial erosion can be added to it to provide an estimate of the volume of rocks deposited and emplaced on the continents at the peak of the Genesis Flood, about Day 150 (Boyd and Snelling, 2014; Johnson and Clarey, 2021). Where did this total continental volume originate? How was it eroded and transported onto the continents? These are questions we cannot answer now, but hope to in the future.

Reed et al. (2023) presented a method for deriving continental sedimentary volumes using global information system (GIS) analysis of mapped surfaces. Total diluvial volume was derived for Colorado and its sedimentary basins. This study illustrated one of the significant unknowns for such a project—the diluvial status of Precambrian sedimentary, volcanic, and metasedimentary rock. In Colorado, these were minor relative to the total volume. In other regions, these Precambrian rocks comprise a significant portion of the total rock record. Examples include the Midcontinent Rift System, the Belt Basin, and the various Baraboo quartzite basins. Which, if any, of these can be attributed to the Noahic Flood? Although we believe that these should be assessed on a case-by-case basis, we provide some basic parameters for doing so in this paper, as well as for the overall scope of such a project.



Figure 1. Upper Precambrian Sixtymile Formation in Grand Canyon (National Park Service, public domain).



Figure 2. A layer of dolomitic stromatolites in Glacier National Park, Montana.

Questions about the Lower Diluvial Boundary

Some creation scientists think oddities in the rock record should define the boundaries. Coulson (2021) placed the lower diluvial boundary at the Carboniferous/Permian boundary because of Cambrian

“stromatolites” in southwest Utah, arguing insufficient time for them to form in the Flood. However, stromatolites are also found elsewhere in the Phanerozoic (Gebelein, 1969; Monty, 1981; Bertrand-Sarfati and Monty, 1994; Riding, 2000; Flügel, 2004), including the Triassic

(Schubert and Bottjer, 1992; Perri and Tucker, 2007; Woods, 2009; Luo et al, 2014) and in the Jurassic Navajo Sandstone (Eisenberg, 2003). Determining diluvial boundaries requires a full analysis, with greater certainty. Puzzles such as stromatolites are insufficient. Some think they are abiotic (see below).

Aside from advocates of the recolonization model (Tyler, 2005), most creation scientists believe that the Mesozoic and Paleozoic are diluvial strata, and many place the lower boundary at, or slightly below, the Cambrian/Precambrian boundary (Austin, 1994; Austin and Wise, 1994; Wise and Snelling, 2006). Dickens (2018) and Dickens and Hutchison (2021) believe the boundary is at the Mesoproterozoic/Neoproterozoic boundary. Hunter (2022) thinks all Precambrian rocks are early Flood. So how are we to determine the answer?

The Discontinuity Criteria

A start would be the multiple “discontinuity” criteria (Table I) proposed by Austin and Wise (1994) and Wise and Snelling (2006). We agree with examining multiple criteria over a wide range of rocks because the efficacy of any one criterion will vary from place to place. In

Table II. The discontinuity criteria and reasons why criteria are equivocal.

Type of Discontinuity	Why Equivocal
Paleontological	Upper Precambrian multi-celled organisms (Precambrian catastrophism would destroy multi-celled organisms), abundant Precambrian microfossils, Upper Archean eukaryotes
Erosional	Other major unconformities exist below the Great Unconformity in the Grand Canyon. Erosion governed by location, elevation, slope, available water, and its energy
Time	Time interpreted, not observed; more likely time discontinuity would be between Precambrian sedimentary rocks and crystalline rocks below
Sedimentary	Finning-upward sequences should be common in Flood and pre-Flood; they should occur also in deep Precambrian sedimentary basins
Tectonic	Tectonic activity likely variable, sufficient erosion can erase evidence



Figure 3 (*left*). View on top of layer of dolomitic stromatolites in Glacier National Park, Montana.

Figure 4 (*below*). Stromatolites in carbonate in Glacier National Park, Montana.



Figure 5. Stromatolites in Figure 5 transition into layered carbonate rocks.

the eastern Grand Canyon, where tilted, thick Precambrian sedimentary rocks exist beneath the Great Unconformity, they defined the lower diluvial boundary just below the Precambrian Sixtymile Formation (Figure 1). In the eastern Mojave Desert near Death Valley, they placed it in the lower Kingston Peak Formation (Austin and Wise, 1994; Wise, 2003), about four km below the top of the Precambrian and two km above crystalline basement. The upper and middle Kingston Peak Formation consists mostly of diamictite, an unsorted or poorly-sorted sedimentary rock with a wide range of particle size. Uniformitarian scientists attribute it to a Late Precambrian ice age, while Austin and Wise (1994) and Wise and Snelling (2006) interpreted it from the perspective of rifting and landslides at the beginning of the Deluge. It is interesting that some secular scientists

also think the Kingston Peak Formation is due to landslides transitioning into rifts (albeit over long periods of time) and not glaciation (Kennedy and Eyles, 2021; Oard, 2021). However, none of the discontinuity criteria are absolute (Table II).

The Paleontological Discontinuity

Since any one of these criteria might not apply at any given place, they proposed multiple confirmatory criteria—a good procedure, though Froede and Oard (2007) and Oard and Froede (2008) reasoned they were not absolute (Table II). The paleontological discontinuity seems primary for many creation scientists, who think a sudden upward abundance of metazoans reveals the basal boundary. While significant, it is not absolute; the paucity of Precambrian metazoans could be due to elevated temperatures, as suggested by abundant dolomite (Oard, 2022a, 2022b). Primary dolomite requires temperatures over 100°C, probably well over that. Moreover, the high energy and resulting turbulence characterizing the early parts of the Flood judgment might have pulverized potential fossils, leaving primarily microorganisms. If impacts occurred at that time, poor conditions of preservation would have been present in affected areas.

As mentioned above, some see abundant Precambrian stromatolites as evidence of antediluvian rocks, since they were once thought to be rare or non-existent in the Phanerozoic. Glacier National Park, Montana, is well-known for stromatolites. Figures 2 and 3 show a layer of dolomitic stromatolites. Figure 4 shows stromatolites in carbonate that transition laterally into thin-bedded carbonate layers (Figure 5). Stromatolites occur today, such as those in the classic area of Shark Bay, Western Australia (Figures 6 and 7), and these take years to grow. Some creation researchers believe



Figure 6. Stromatolites in Shark Bay, Western Australia (Happy Little Nomad, Wikipedia Commons CC-BY-SA-2.0). Notice that the stromatolites are mostly isolated, mushroom-shaped buildups.



Figure 7. Close up of a Shark Bay stromatolite as displayed in the Museum of the Rockies, Bozeman, Montana.

Figure 8 (right). The geological column, showing three locations where creation scientists have placed the upper diluvial boundary (horizontal arrows on right side). Only a few have assumed the Upper Paleozoic boundary where Coulson now places the basal diluvial boundary.

stromatolites in the sedimentary rocks are biological (Purdom and Snelling, 2013; Snelling and Purdom, 2013). Snelling (2009, p. 634) states:

The fact that stromatolites and these bacteria [that built the structure] are among the major fossils of the Precambrian rock record, and then are virtually absent in Phanerozoic rocks and are rare today, suggests that these stromatolites were a significant part of an important late Creation Week/pre-Flood hydrothermal biome.

However, stromatolites are well known to exist in the Phanerozoic and are not so rare. Coulson (2021) has found Upper Cambrian stromatolites in southwest Utah that also occur over many other locations of the world. Despite Coulson (2021), many fossil stromatolites appear to be much different from those forming today, which may indicate an inorganic origin (Oard and Froede, 2008). For instance, practically all stromatolites are found in carbonates. Schopf (2006) states: “Almost all known ancient stromatolites are or were originally of calcareous composition.” However, modern stromatolites bind all kinds of sediments (Schieber, 1998). Perhaps creation scientists should be looking for other mechanisms. Some uniformitarian scientists believe that some stromatolites could be non-biological (Lowe, 1994; Grotzinger and Rothman, 1996; Walter, 1996; Schieber, 1998; Brasier et al., 2006; Stokstad, 2006).

Subdivisions of Geologic Time and Symbols					
ERA	PERIOD AND SUBPERIOD		EPOCH	AGE (Ma)	
CENOZOIC	QUATERNARY		Holocene	2.6	
			Pleistocene		
	TERTIARY	NEOGENE SUBPERIOD	Pliocene	5.3	
			Miocene		
		PALEOGENE SUBPERIOD	Oligocene	23.0	
			Eocene		
			Paleocene		
MESOZOIC	CRETACEOUS		Late	65	
			Early		
	JURASSIC			Late	145
				Middle	
				Early	
	TRIASSIC			Late	200
				Middle	
				Early	
	PALEOZOIC	PERMIAN		Late	251
				Middle	
PENNSYLVANIAN				Late	←
				Middle	
				Early	
MISSISSIPPIAN				Late	320
				Early	
DEVONIAN				Late	359
				Middle	
				Early	
SILURIAN				Late	416
				Middle	
				Early	
ORDOVICIAN			Late	444	
			Middle		
			Early		
CAMBRIAN			Late	488	
			Middle		
			Early		
PROTEROZOIC				542	
ARCHEAN				2500	
				3800	

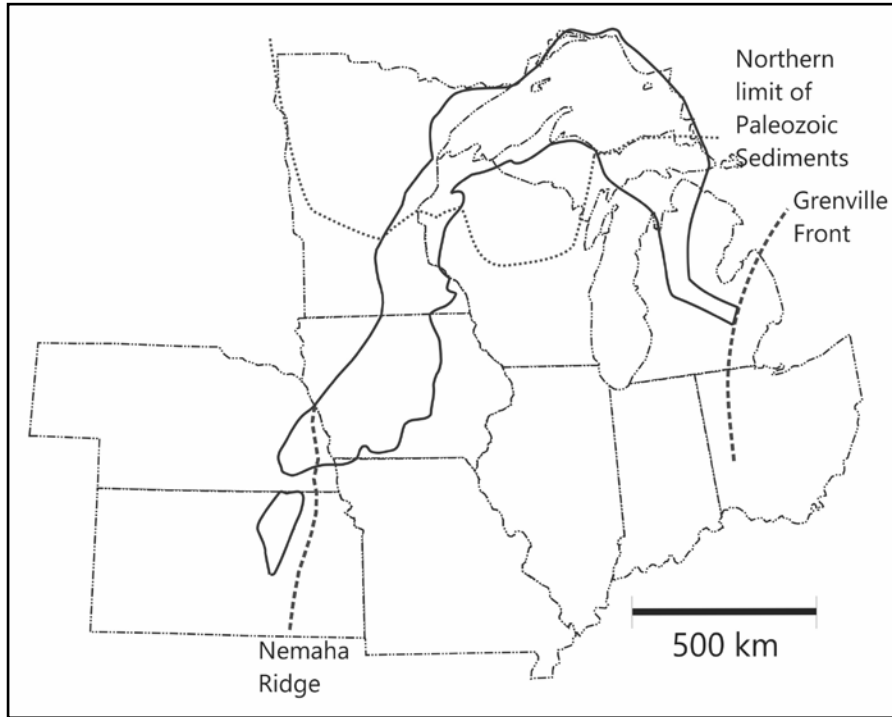


Figure 9. Map of the North American Midcontinental Rift within the solid lines.

Current Views on the Place of the Precambrian in Biblical Earth History

It is clear that Precambrian sedimentary and volcanic rocks need to be assessed using all the evidence. At present, creation scientists differ on whether the Precambrian is a record of the Creation Week, the antediluvian period, or the global Flood.

Creation Week

Dickens and Snelling (2008) and Dickens (2018) think the relative order of Precambrian radiometric dates is valid. They also see a sequence of Precambrian events correlative to Creation Week, the antediluvian period, and the Deluge. In this view, the Archean Era (Figure 8) correlates to Day 1 of the Flood Year with abiotic stromatolite-like features that gave way to biotic stromatolites and banded iron formations (BIFs) in the Upper Archean and Lower Paleoproterozoic of Day 2. Note that they admit that some stromatolites are abiological. The Mesoproterozoic was interpreted as a time of rifting on Day 3, such as the Midcontinental Rift in North America (Figure 9). The Neoproterozoic is considered early Flood by Dickens (2008), Dickens and Hutchison (2021), and Dickens and Snelling (2008) but primarily antediluvian by Snelling (2009, p. 662).

Antediluvian

Humphreys (2014) places most of the Precambrian between Creation and the Flood, based on the decay of the Moon's magnetic field, remnant magnetism in Moon rocks, and accelerated radiometric decay. Spencer (2015) questions this scenario because the scale of Precambrian impacts and processes would be too catastrophic. Most creation scientists believe that geological effects of the Fall were benign (Snelling, 2009), but we cannot know.

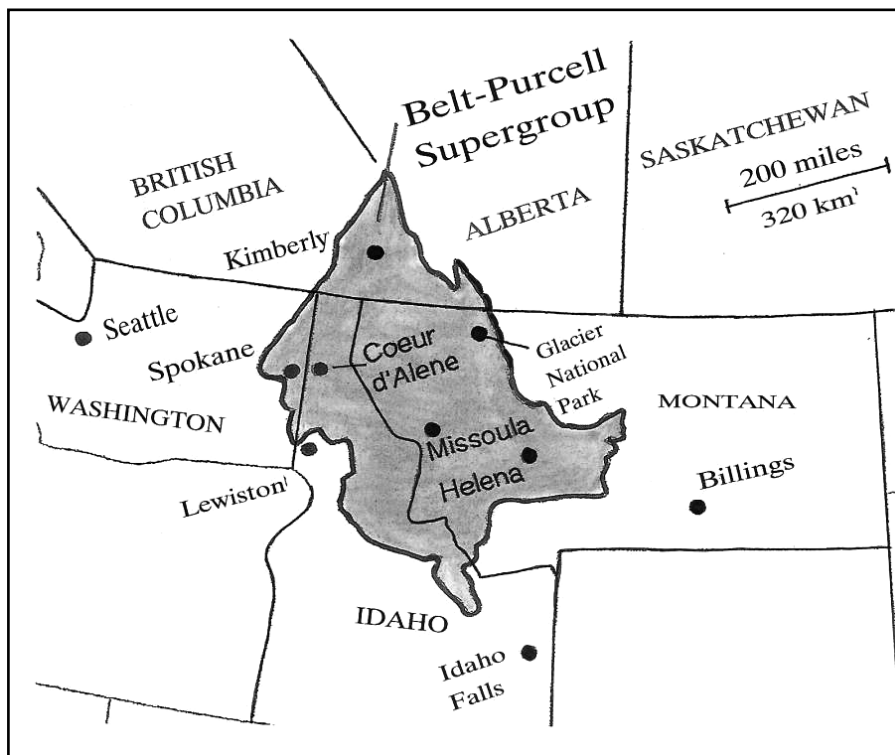


Figure 10. Map of the Belt Basin. Scale is in the upper right.



Figure 11. Quartzite layers in the Belt Supergroup.



Figure 12. Abrupt changes in the color of argillite from red (oxidized, right) to green (reduced, left).

Early Flood

We suspect that much of the Precambrian sedimentary record, along with associated igneous and metamorphic rocks, formed at the onset of the Flood (Oard, 2014; Oard and Reed, 2017). Our reasons include: (1) evidence for large-scale catastrophism congruent with the Flood, (2) Precambrian impacts that would have devastated antediluvian life; (3) the continuity of certain unique rocks across the Precambrian/Phanerozoic boundary, such as black shale, carbonates, quartz arenite sandstone, and phosphorites (Oard, 2013); and (4) the apparent conformity moving up through the Mesoproterozoic Belt Supergroup into the Cambrian Flathead Sandstone.

The Belt Supergroup

Mesoproterozoic metasedimentary rocks crop out in western Montana, northern and central Idaho, northeast Washington, and adjacent Canada over an area of 197,000 km² (Link et al., 2021). Called the Belt Supergroup in the U.S.A., they are named the Purcell Supergroup in Canada. Researchers often simply call them the Belt-Purcell Supergroup. They were deposited in the Belt Basin (Figure 10). The maximum known thickness of Belt rocks is 20 km, west of Missoula, Montana (Harrison et al., 1974). The Belt rocks may be considerably thicker in northwest Montana (MacLean and Sears, 2016). The sediments were deposited with little deformation, but later mildly metamorphosed to quartzite (Figure 11) and argillite, then uplifted, faulted, and folded. Finally, the upper section was removed by erosion. The argillite often changes to red (oxidized) to green (reduced) abruptly (Figure 12). The Belt Supergroup is dated as Early Mesoproterozoic at 1,470–1,400 Ma, based on U-Pb dating.

The Cambrian Flathead Sandstone in Montana, correlative with the Tapeats Sandstone in Grand Canyon, overlies Belt rocks at many locations, and the contact represents about one billion years



Figure 13. The Belt/Cambrian contact in Bridger Mountains (Peter Klevberg is pointing at the contact).

of missing time (i.e., presumed evolutionary time) at the contact. It is 30 to 100 m thick, coarse-grained with quartz pebbles, few shale interbeds, and was deposited mostly over crystalline basement over nearly half of North America (if correlative formations are included). The Flathead Sandstone is claimed to be disconformable with the Belt rocks, with a slight angular unconformity in spots (Harrison et al., 1974; Harrison and Cressman, 1993). Deiss (1935) acknowledged that many geologists cannot see that unconformity because the relationship is rarely angular, but he found eight locations with

a slight angular unconformity. Campbell (1960, p. 573) reinforced this lack of an angular unconformity: “The angular discordance between the Precambrian and the Cambrian beds at these locations is so slight that it was not detected.” Oard and Klevberg have seen one of these contacts at the top of the Bridger Mountains, and it appears conformable (Figure 13). The big picture indicates continuous sedimentation from the Belt Supergroup upward into the Paleozoic. This is one of the main reasons we think the Mesoproterozoic Belt Supergroup was very early Flood.

The Vredefort and Sudbury Impacts

The Vredefort (Figures 14 and 15) and Sudbury (Figure 16) impacts are well-documented and dated at about 2 Ga. The present Vredefort and Sudbury craters are 250 km and 200 km in diameter, respectively (Huber et al., 2020; Allen et al., 2022), despite 8–11 km of erosion in the Vredefort area and 5 km of erosion in the Sudbury area (Senft and Stewart, 2009). That could be the equivalent of erosion from the Kaapvaal and Canadian Shields, respectively, if the locations of these impacts are representative of the whole shield. This would mean that

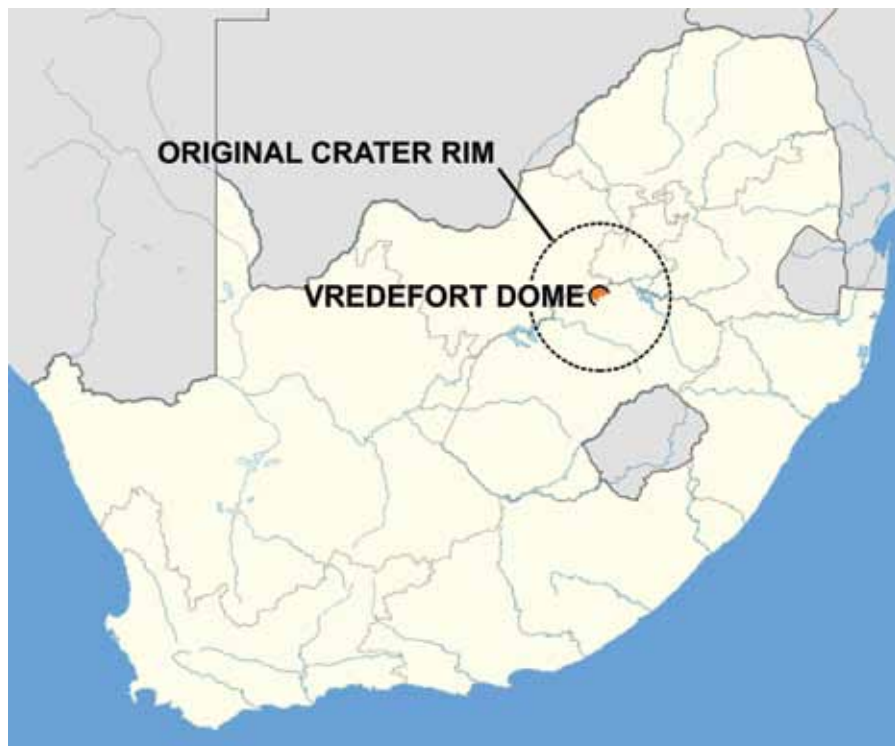
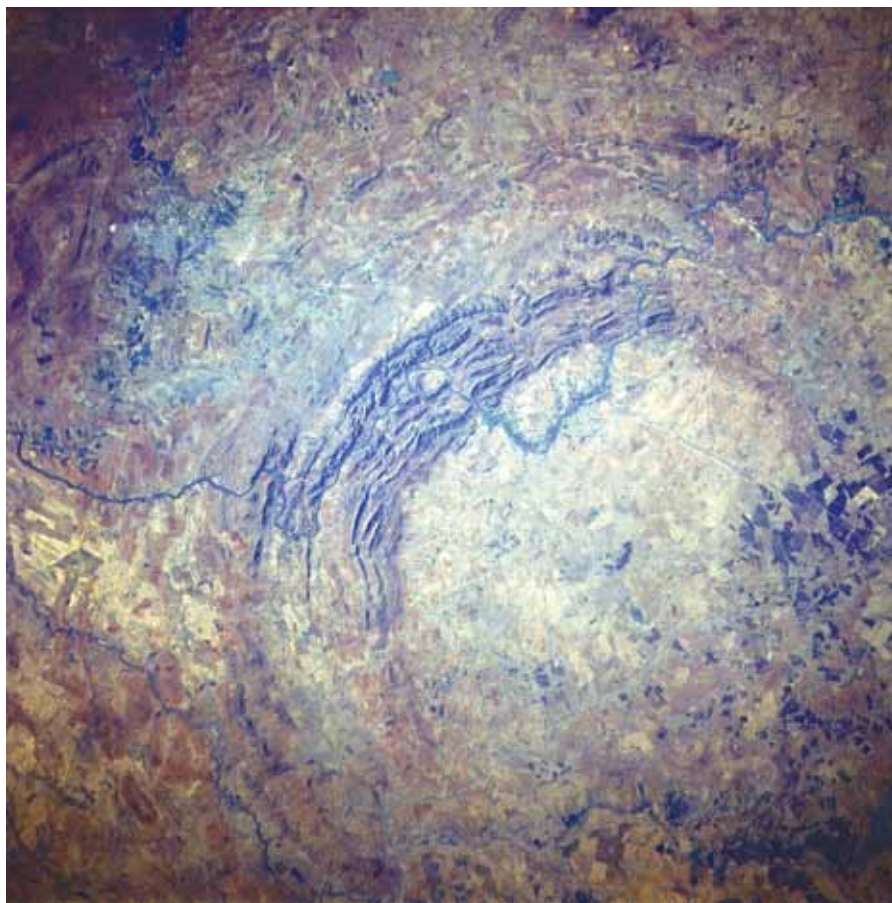


Figure 14 (*above*). Map of South Africa showing the location of the Vredefort dome and the probable location of its original rim (Oggmus, Wikipedia Commons CC-BY-SA-3.0).

Figure 15 (*right*). The upturned central portion of the Vredefort impact structure, South Africa (Júlio Reis, Wikipedia Commons, PD NASA).



much sediment was deposited at least on these two shields that was subsequently eroded off.

The surface of the Canadian Shield is likely part of the Great Unconformity (Sturrock et al., 2021). The region was once covered by Paleozoic and Mesozoic sediments, as shown by erosional remnants (Ambrose, 1964; Clarey, 2020b). Feinstein et al. (2009, p. 190) state:

...all or much of the Canadian Shield was once overlain by significant Phanerozoic successions that are now completely or nearly completely eroded across broad regions, apparently as the result of epeirogenesis.

Thus, the Canadian Shield likely is an exhumed erosion surface. However, Clarey (2020) found that all of the Phanerozoic rocks thin towards the Canadian Shield.

How Destructive Would Vredefort and Sudbury Have Been?

Destruction by impacts depends on many variables, but can be correlated to crater size, as a surrogate for impact energy. The Earth Impact Effects Program indicates that these two impacts

would have devastated an area equal to today's land mass. However, it does not account for the curvature of the Earth (Collins et al., 2005). Taking this variable into consideration, strong winds and the fireball from these two impacts would have destroyed only

15% of today's continental area (Toon et al., 1997).

But air blast and fireball are only two effects of an impact. An impact of that scale would send debris and vapor on ballistic trajectories over much of the Earth (Toon et al., 1997; Toon et

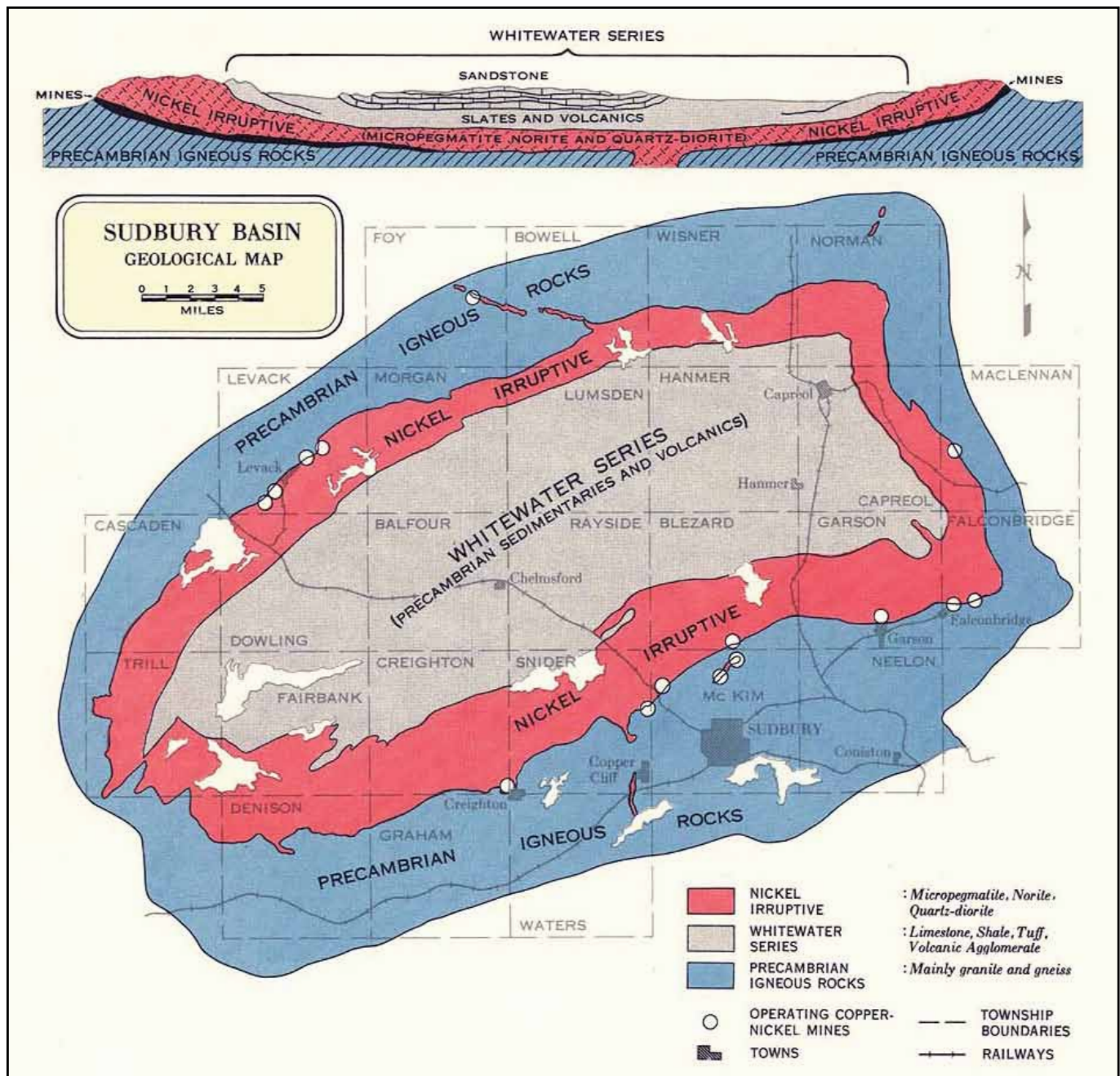


Figure 16. Geological map of Sudbury Basin (Natural Resources Canada, Wikipedia Commons public domain).

al., 2016; Bardeen et al., 2017). The vapor would condense into spherules. Debris and spherules that would not overcome Earth's gravity would accelerate back, striking the top of the atmosphere at velocities little less than escape velocity. Strong frictional heating to around 1600°K would radiate upward and downward. Downward infrared radiation would cause global wildfires by igniting lichen, grass, pine needles, etc. (Goldin and Melosh, 2009; Robertson et al., 2013; Toon et al., 2016). The optical depth of debris and wildfire soot would shroud Earth in total darkness, stopping photosynthesis. The submicron particles would cause impact winter that would last years. Acid rain and air pollution would be intense. The ozone shield would largely disappear.

That is just from two confirmed large Precambrian impacts. There are 28 smaller confirmed impacts in the Proterozoic (Schmieder and Kring, 2020) that had the potential to devastate local and regional areas. Of course, if these impacts occurred early in the Deluge, the heavy continuous rain would mitigate some of these effects. But if they are antediluvian, they would have had the potential to destroy the surface of the Earth and its inhabitants *before* the Flood.

Huge Archean Impacts

There likely were other impacts not yet recorded in the Earth Impact Database. Evidence for these comes from Archean spherule layers (older than 2.5 Ga) occurring in sedimentary, volcanic, and volcanoclastic rocks in Western Australia and eastern South Africa (Simonson et al., 2000). The spherules are about 0.1–4 mm in diameter and form layers ranging from 0.4 to 70 cm thick. But these layers cover hundreds of km distance (Glass and Simonson, 2012) and are dated 3.47 to 2.49 billion years (Smith et al., 2016). Shocked quartz and high-pressure rutile (TiO₂—II) have also been found (Rasmussen and Koeberl, 2004; Smith

et al., 2016). The number of Archean impacts and their sizes are debated, but it seems that the spherule layers could represent at least 11 impacts from bodies 10–100 km in diameter (Johnson et al., 2016; Schmieder and Kring, 2020). The low end of these estimates are the size of the Vredefort and Sudbury impactors. If these spherules represent huge impacts, these likely are also from the early Flood.

Precambrian Sedimentary Rocks Need to Be Included in Volume Estimates

Precambrian impacts are significant in any Flood model. Their stratigraphic position suggests that most Precambrian sedimentary rocks are early Flood (Oard, 2014; Spencer, 2015). Some igneous and metamorphic rocks may also be part of the diluvial rock record, especially if associated with sedimentary rocks, such as interbedded within the Precambrian sedimentary rocks. Such a determination would be critical for mapping a basal diluvial boundary. However, we suggest that large basins, like the Belt, be assessed by their own evidence. In general, we propose to map at the base of many such rocks. In many cases, we will also map the top of the Precambrian and compare the results in doing volumetric analyses of the diluvial rock record.

Summary

Calculating Flood sediment volume requires mapping both basal and upper diluvial boundaries. Discerning these surfaces can be difficult. Particularly important is the status of Precambrian sedimentary and volcanic rocks. Features like the Belt Basin and Midcontinent Rift are extensive with thick sedimentary and thick volcanic rocks in the latter. Examining each feature using multiple criteria and comparing maps both above and beneath them seems the best approach. In general, we provisionally place Precambrian sedimentary rocks,

large impacts, quartzite outcrops, and sedimentary basins in the diluvial record.

To accommodate this uncertainty, we have developed a method of “plug-and-play” for mapped surfaces that can present volumetric analyses for different horizons (Reed et al., 2023). We are also working to develop other physical criteria that may be more widely applied. At present, such a determination is often based on the local conditions and regional context, such as the conformable contact between the Belt series and the Flathead Sandstone. The ultimate goal is a well-constrained, well-supported determination of sediment volume and distribution to aid in our understanding of the Genesis Flood and then to determine where that sediment originated.

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Darwinism, Inferior Races, Sports, and Hitler's Olympics

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Abstract

Historically, Black people have excelled in certain sports. This fact produced a problem for Darwinists since they believe that an ‘inferior race’ cannot be physically (or mentally) superior to other races. To resolve this contradiction, it was believed that since those with black skin were less evolved, their bodies retained ‘animal bestial athletic abilities.’ Thus, they were better at athletics. Nazi Germany embraced this explanation as the ‘solution’ to this contradiction. Ultimately, this belief found its way into the United States. The racism that Darwin produced resulted from a rejection of the clear teaching of Scripture that all humans were descended from the first couple as described in Genesis. The Biblical truth is only one race exists, the human race.

Introduction

Darwinism was interpreted in Germany as evolution resulting from the survival of the fittest *race*; in America, Darwinism was viewed as resulting from the survival of the fittest *individual* (Krüger and Murray, 2003, pp. 17, 36). Evolutionists widely concluded that “inferior races” were both mentally and physically inferior. University of Texas professor John Hoberman explained that racial evaluation judgments made during the latter part of the nineteenth century included physical ability comparisons and

Charles Darwin was only one of many who assumed that Europeans were generally stronger than

darker-skinned people and that the performances of their explorers had confirmed this. In *The Descent of Man*, he stated that “civilized men [have] been found, wherever compared, to be physically stronger than savages. They [whites] appear also to have equal powers of endurance, as has been proved in many adventurous expeditions.” (Hoberman, 1997, p. 105)

This belief predated Darwin:

Even before the appearance of Darwin’s influential book in 1871, the German anthropologist Theodor Waitz had made the same point. In addition, he made an important

distinction between vitality and muscular force that is characteristic of nineteenth-century racial anthropology....This distinction between the savage and the better-disciplined (and therefore better-trained) European helped to preserve the latter’s athletic self-image and thus his sense of authority. (Hobermann, 1997, pp. 105–106)

The sources of Hitler’s racist’s ideas were complex, but one factor is clear. As the author/founder of the Science and Genetic Literacy Project, Jon Entine noted, the “young Adolf Hitler developed an obsession with the concept of evolution” and in 1924 he read

an internationally recognized textbook on genetics, *Human Heredity*, written by German biologists Erwin Baur, Eugen Fischer, and Fritz Lenz. Hitler twisted eugen-

ics to serve his political version of “survival of the fittest,”—who by his measure were the obviously superior Aryans. The title of his autobiography, *Mein Kampf*, translated as *My Struggle*, is widely thought to be a play on Darwin’s *On the Origin of Species*, which is subtitled “Struggle for Existence.” (Entine, 2000, pp. 178–179)

Although racism and anti-Semitism existed before the Scientific Revolution, construction of fixed and firm “racial” hierarchies and cultural taxonomies—grounded in references to measurable distinctions, among other pretensions to scientific objectivity—lent academic authority to popular [racist] thought and practice. And in an increasingly secular age, such discriminations became all the more influential. (Miller, 1996, p. 128)

Indoctrination in Racism

German 1930s sports imagery actively promoted the myth of Aryan racial superiority and physical power. Artists idealized the athletes’ well-developed muscle tone and heroic strength. Often accentuated were the so-called Aryan facial features, especially blue eyes and blond hair (characteristics that are, in reality, more typical of Scandinavians than Germans). Such imagery reflected the importance the Nazi regime placed in their belief of the superior physical fitness of the Aryan race.

The problem the Nazis had with Jews was with their ‘race’ (actually their ethnicity), *not* their religion, since converting to Christianity did not remove their “poisonous racial taint” (Mandell, 1971, p. 61). Consequently, they were murdered in the concentration camps like those of any other so-called “inferior” race. The German Ministry of the Interior authorized the chief of police to arrest all Romani (Gypsies) who were also seen as racially inferior. They were interned

in a special camp *before* the Olympics commenced (Bergman, 2020).

Nazification of Germany and the eugenics programs involved all aspects of German life, even sports. A staunch Nazi close to Hitler, Hans von Tschammer und Osten, headed the Reich Sports Office that oversaw all organized German sports activities and clubs, including the German Olympic Committee. The Nazi government honed in on promoting sports, not only to prove the superiority of the ‘Aryan race’ but also to strengthen the German youth for war.

German Minister of Propaganda, Joseph Goebbels, wrote on April 23, 1933, that “German sport has only one task: to strengthen the character of the German people, imbuing it with the fighting spirit and steadfast camaraderie necessary in the struggle for its existence” as taught by Darwinism (Fosty and Fosty, 2014, p. 127). In short,

Darwinist racial theories ... emphasize the interplay among the principles of evolution and selection as developed by Darwin, namely that human groups living in isolation from one another have developed unequally due to dissimilar processes of selection. It is this inequality that matters once races encounter each other, and in the ‘competitive struggle for existence’ races are superior or inferior with regard to selection. In the nineteenth century Darwinist racial theories led to the emergence of the specific racist theories of Social Darwinism. (Marten, 1999, p. 27)

The Nazis systematically excluded all “Non-Aryans” including Blacks, Gypsies, and Jews, and mixed “Aryan” and non-Aryan persons called *Mischling*, from German sports facilities and associations. Nazi Germany allowed only members of the “Aryan” race to compete for Germany in order to further promote Hitler’s Darwinian racial supremacy beliefs. As a result of the Nazi sports ban, several German Jewish athletes, such as Dr. Daniel Prenn, Germany’s top tennis

player since 1928, became British subjects (Mandell, 1971, pp. 62–63).

For international events, Hitler was unable to ban Jews from other nations. Consequently, Professor Robert Mandell observed many Polish, Czechoslovakian, and Hungarian Jews were part of their home Olympic teams, negating the myth of superior Aryan physical abilities (Mandell, 1971, p. 80). Hitler had no desire “to see proud ‘Aryans’ competing with their racial inferiors” and ruled that, in the future, the German Olympic games would involve only Aryans (Krüger and Murray, 2003, p. 1).

Hitler even proposed a fashion dress reform to promote a “healthier mode of dress which would uncover the bodies of the best of Aryan youth so that the maiden will ‘know her knight. If beautiful bodies were not completely placed in the background by our foppish modes, the seduction of hundreds of thousands of girls by bowlegged, disgusting Jew bastards would be quite impossible” (quoted in Mandell, 1987, p. 234).

The 1936 Berlin Olympics

The connection between racism and sports is best illustrated by the events that occurred at the 1936 Olympics. The 1936 Summer Olympics was an international multi-sport event held in Berlin, Germany. Berlin was selected to host the Games on April 26, 1931, two years before the Nazis came to power. Miller concluded that “no event in the history of modern sport has been more significant in either its impact or implications than the Summer Olympics of 1936” (Miller, 1996, p. 129).

At these pivotal 1936 Olympics, several of the visiting nations displayed behaviors that were blatantly sympathetic to Nazism, revealing a growing international acceptance of Darwinian racism. During the preliminary ceremonies, the Afghans, Bermudans, Bolivians, Icelanders, Italians, and Austrians gave a clear full-arm fascist salute. The Bul-

garians went further and not only gave a Nazi salute, but broke into the Nazi goose-step march. The Turks maintained the Nazi salute all around the track. Half the Austrians gave the Nazi salute and the other half the Olympic salute (Edmondson, 2007, p. 44).

The Chinese and Filipinos used neither salute but, instead, put their hands on their chest near their hearts. The crowd cheered the French, who they thought gave the Nazi salute, but conflicting reports exist as to whether they had given the Nazi or Olympic salute. The British gave a simple eyes-right salute, and as a result were coolly received. The Americans gave a “hat over heart” gesture, and were given a noisy whistling reception as they left the stadium. Over 110,000 people attended the opening ceremonies (Edmondson, 2007, p. 44).

Germany Camouflages Its Racist Agenda

Hitler initially held the Olympics in low regard both because of his lack of interest in all sports and its internationalism. He became an avid Olympic supporter only after Goebbels convinced him of the games’ important propaganda value (Large, 2007, pp. 59–60). As a result, the Nazis provided financial support for the event amounting to over 20 million Reichsmarks, or about 8 million U.S. dollars. Goebbels thought the games would give the Nazi’s public a showing to prove their racist theories (Streissguth, 2005, p. 52).

While hosting the Summer Olympics, the Nazis wanted to present to the world an image of a peaceful, tolerant Germany. Consequently, during the Olympics for the two weeks in August of 1936, the Nazis camouflaged their racist and militaristic goals. After hiding their anti-Semitic agenda and their plans for territorial expansion, the regime exploited the Olympic Games in an effort to bedazzle the many foreign spectators

and journalists with the grandeur of Nazi Germany. The result was that

open intimidation of Jews in Germany was suspended, so the beating of Jews, previously reported to make the Jews look criminal and to justify their lynching, was outlawed. The order for the national press was explicit: “With respect to the upcoming Olympic Winter Games and until further notice, it is strictly prohibited to report disputes with foreigners in Germany or actual controversies with Jews. Even in local reporting such incidents are not to be mentioned under any circumstances, to avoid giving foreigners propaganda to use against Germany.” The “pause” on Jew-baiting in the press remained through the Summer Games, forcing the yellow press to overlook stories of the rigorous application of the Nuremberg Laws that previously it had assiduously dwelt on. (Krüger and Murray, 2003, pp. 24–25)

The Nazis even removed the “Jews not wanted” and similar signs from the city’s main tourist attractions in an attempt to hide their racism from visitors. It worked. Ticket revenues alone were 7.5 million Reichsmarks, generating a profit of over one million marks. Tolerance, though, had its limits.

During the Olympics, Nazi officer “Schirach suggested that the impression of amiability that was the theme of the hour might be strengthened if Hitler were to be photographed with his rival in popularity, [the American Black athlete] Jesse Owens” (Mandell, 1971, p. 236). Jesse Owens in particular would challenge both the American and Nazi idea of inferior race (see Figures 1 and 2). Hitler was so angry over Owens’ presence in the Olympics that “the Führer blew up and screamed at what he thought was the grossest insult. However, these reactions [by Hitler] were viewed by few [persons] and were suppressed” (Mandell, 1971, p. 236).

Anti-Black Racism and Sports

Racism in many nations was especially strong against dark-skinned people. It was not only the Germans that “were rotten with anti-Negro prejudice” and were corrupted by the “save-the-white-race” ethic, but talented Black athletes in other nations were not allowed to participate in many sports in Nazi Germany (Mandell, 1971, pp. 115, 221). Nonetheless, neither Germany nor America could ignore one Black American named Joe Louis because he was a star athlete and

a surpassingly handsome physical specimen, clean, abstemious, loyal to his mother, and serious. He never shot his mouth off. In short he was hailed as a credit to his race. His neatly tucked stance and economy of movement reeked of science. An admiring reporter observed: “Any romantic white person who believes that the Negro possesses a distinctive quality ought to see Louis. He suggests a gorilla or a jungle lion about as much as [he does] an assistant professor at the Massachusetts Institute of Technology.” (Mandell, 1971, pp. 115–116)

Other American Black Olympic contestants included Cornelius Johnson and David Albritton (Large, 2007, p. 230). The participation of Blacks in the Olympics was controversial, not just in Germany but in the entire Western world. The reason was that they (Negroes and native Africans) were an ethnic group that both the German and American race scientists regarded as inferior. One Black in particular would challenge both the American and Nazi idea of inferior race. His name was Jesse Owens.

Jesse Owens

Owens held the world’s record for the long jump, and high expectations existed for him at the 1936 Olympics. He more than fulfilled them and won, not one, but four gold medals (Miller, 1996,



Figure 1. Jesse Owens performing at the 1936 Olympics in Berlin, Germany. From Wikimedia Commons; https://commons.wikimedia.org/wiki/Jesse_Owens.

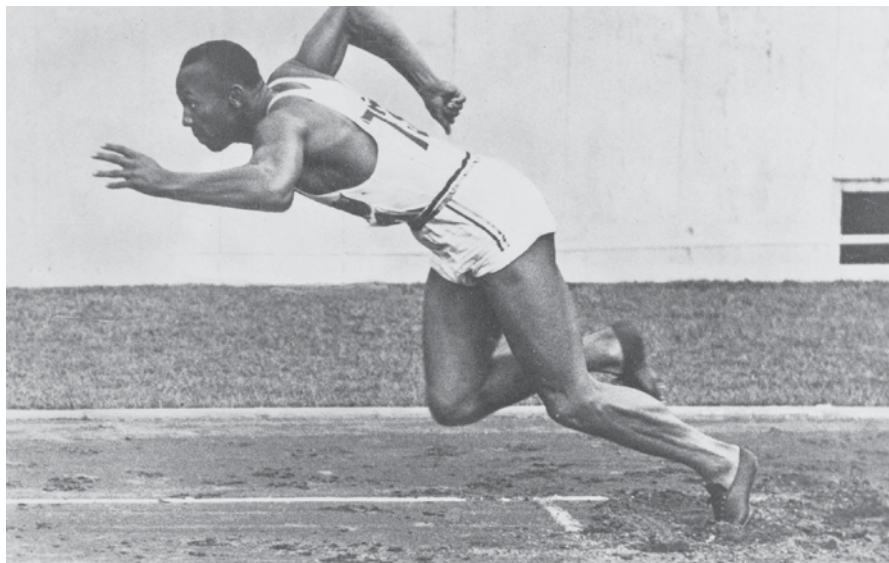


Figure 2. Jesse Owens performing at the 1936 Olympics in Berlin, Germany. From Wikimedia Commons; https://commons.wikimedia.org/wiki/Jesse_Owens.

p. 130). Ironically, in Berlin, Owens was able to use public transportation and patronize public facilities without the segregation and discrimination he faced as a Black man in much of the United States in the 1930s. In fact, a few Black Africans, such as Hans Massaquoi, lived in Nazi Germany with relatively few problems (Massaquoi, 1999).

Because Hitler endeavored to present a tolerant, friendly face to the world, he did not publicly, overtly snub minorities. Reports that Hitler deliberately avoided acknowledging Owens' victories, and even refused to shake his hand, were discounted by Owens himself (Baker, 2006, pp. 90–91). Specifically, Owens recounted, "When I passed the Chancellor he arose, waved his hand at me, and I waved back at him.... Hitler didn't snub me—it was FDR who snubbed me. The president didn't even send me a telegram" (quoted in Schaap, 2007, p. 193).

Others, though, recognized that Hitler regarded Blacks as an inferior race

and Hitler did not shy away from relating this fact to his close associates (Large, 2007, pp. 232–233). Nonetheless, for good reason, Owens was very positive about the Germans:

German spectators gave him the warmest ovation of his life. Just before he entered the stadium, Larry Snyder warned him to be ready for a hostile reception: "Don't let anything you hear from the stands upset you. Ignore the insults and you'll be alright." Little did Snyder know that German admiration for athletic achievement transcended racial prejudice. From the moment Owens first appeared on the track, curious German athletes and coaches milled around him. ... Then, after Jesse won his first heat, the entire stadium burst out in thunderous applause. From then on he received a loud ovation every time he walked onto the track. (Baker, 2006, p. 92)

In the 1936 Olympics environment, with

the omnipresent Nazi swastika and salute, as well as the medals won

by German athletes in a variety of events, contemporary observers of the Berlin Games were also inclined at times to refer to the athletic pageant as the "Jesse Owens Olympics." The victories by Owens in the 100 and 200 meter dashes, the long jump and sprint relay—as well as the stellar accomplishments of Ralph Metcalfe, Archie Williams, John Woodruff, Cornelius Johnson and other African-American competitors—had a profound impact not just on contemporary sports coverage but on racial ideology as well. (Miller, 1996, p. 129)

After the Olympics was over, Owens' name was hammered into the bronze plaque on the Berlin stadium four times, one for each of his four gold medals. The four records he set, for which he was awarded medals, replaced five athletes' world records. Owens held three of his records for 15 years, and the other was undefeated for 25 years (Durant and Bettmann, 1973, p. 208).

Hitler's contempt for Owens and races he deemed "inferior" arose

mostly in private, where Olympic neutrality was not required. Hitler's war armaments minister, Albert Speer, recollected that all of the "German victories—and there were a surprising number of them—made him [Hitler] happy, but he was highly annoyed by the series of triumphs by the marvelous colored American runner, Jesse Owens" (Speer, 1970, p. 73).

Hitler once expressed his racist views to Baldur von Schirach, the German politician who served as head of the Hitler Youth from 1931 to 1940. Specifically, Hitler stated that the "Americans ought to be ashamed of themselves for letting their medals be won by Negroes. I myself would never even shake hands with one of them" (Mandell, 1971, p. 236). The strength of Hitler's view was revealed in 1935 by one Olympic official who traveled to Germany just prior to the 1935 Nuremberg Party Rally in an attempt to persuade the Reich authorities to name at least one token Jew to the 1936 German Olympic team. On August 24 this official

discussed the matter personally with Hitler in Munich, proposing that Germany add a Jewish athlete to its team for the Berlin games, a symbolic gesture he compared with the American tradition of "the token Negro." He warned that if Germany did not do this, America might boycott Berlin. To reinforce his point, he reminded Hitler of the Jews' tremendous influence in America, especially in New York City, where he said "the Jew La Guardia" (La Guardia's mother was Jewish) was cultivating "anti-Nazi sentiment" ... But Hitler flatly rejected such tokenism, insisting there could be no Jewish participation on the German teams, period. If the IOC insisted on polluting Germany's teams with Jews, he said, he would call the whole damn thing off and substitute "purely German Olympic Games." (Large, 2007, pp. 84–85)

Hitler himself was hardly an example of the supposedly superior Aryan physical traits he valued. He was not involved in any physical activity except taking regular walks. Hitler "stayed resolutely clear of all competitive games" because he did not want to risk "looking less svelte and physically hardened than what might have been expected of the leader of the 'master race'" (Large, 2007, p. 59). Hitler was even described as a physically weak man who was "entirely un-athletic" (Mandell, 1971, p. 291).

Sports Changes the View of Inferior Races

The view of "primitive" Negroid peoples began

to change in the early 1930s, due largely to the strong performances in the 1932 Olympic Games by the American blacks Eddie Tolan and Ralph Metcalfe (sprints) and Edward Gordon (long jump). Now some white (and even some black) commentators began to argue that blacks possessed certain anatomical advantages over whites that "explained" their recent successes in sprinting and jumping. (Large, 2007, p. 330)

The problem that racists had to deal with was, "How could these members of inferior races have done so well in the Olympics?" They did so well that "the Negroes' ... spectacular performance has done more than any other single factor to make these the greatest Olympics in history" (Krüger and Murray, 2003, p. 62). Hitler and many others explained this by arguing that "People whose antecedents came from the jungle were primitive," and their more primitive physical traits made them physically

stronger than those of civilized whites. They represented unfair competition and hence must be excluded from future games. Hitler was also jolted by the jubilation of the Berliners when the French team

filed solemnly into the Olympic Stadium ... Hitler ... was more disturbed than pleased by the Berliners' cheers. (Speer, 1970, p. 73)

The Nazi assistant to Foreign Minister von Ribbentrop even claimed that the United States took advantage of Germany by allowing "non-humans like Owens and other Negro athletes" to compete in the Olympics (Erenberg, 2006, p. 105).

Racism Supported by Evolution

Darwinian-based racism was not unique to Nazi Germany. The conclusion that "Blacks and other 'primitive' peoples owed whatever athletic successes they might achieve" to their animal past was common in other countries including the United States (Large, 2007, p. 330). R. Meade Bache "in 1895 interpreted racial ability in boxing as an example of the Darwinian 'law of compensation' which postulated an inverse relationship between brain and brawn, between 'intelligence' and 'primitive constitution'" (Hoberman, 1997, p. 189). Nevertheless, the "prevailing view for much of the early twentieth century" was that white athletic achievement

derived from a combination of superior minds *and* superior bodies. The dominance in the early Olympic Games by whites of northern European extraction buttressed this perspective. In boxing, repeated victories over whites by black fighters like Australia's Peter Jackson and America's Jack Johnson generated some speculation about "inherent" Negro advantages in that brutal sport, but since blacks could compete only against other blacks in most athletic arenas the myth of white athletic supremacy went largely unchallenged. (Large, 2007, p. 330)

In explaining the jumping styles of Owens and his chief competitor, Luz Long, one German used

pseudoscientific racial terms: “In the person of the Nordic type, [we find] a well-thought-out style, a systematic working towards the outside edge of the takeoff point, in order to achieve an ever-better performance, a pulling together of the entire body. In the Negro [we find] an unsystematic upwards rush of the body, almost like the elegant and easy jump of an animal in the wild.” This comment presaged the manner in which the Nazis would deal with the long parade of victories by America’s black stars. (Large, 2007, p. 239)

In short, Nazi racism was eloquently demonstrated by the treatment of Black and Jewish athletes in the Olympics, documenting their belief that Aryans were the superior race, both intellectually and physically. But when a member of an inferior race excelled physically, the Nazis rationalized their achievement by claiming that Blacks were “more apelike” and less-removed from our ape ancestry than whites. As Professor Richard Mandell noted, “In view of the hostility against the Negro in general and the Negro athlete in particular, it is quite extraordinary that any of them made it to the top at all” (1971, p. 221). Remnants of this view are still with us today, although often more subtle (Goff et al., 2008, p. 292).

The Effect of the Results in America

The Nazi racist idea that Blacks being closer to a primitive race accounted for their athletic skill was also shared by many Americans (Miller, 1998). In fact, the 1936 Olympics proved to have a major impact on the spread of racist ideas in America. As author and Nazi sports researcher, David Clay Large explains, it was the 1936 Olympics which hardened “pseudoscientific nostrums” that primitive races had superior athletic skills due to their jungle life past. As a

result of this ideology/philosophy, the idea spread widely

among sports commentators, officials, and coaches, Avery Brundage wrote that “one could see, particularly with Jesse Owens, how the Negroes could excel in track events. Their muscle structure lends itself to this sort of competition.” Albert McGall, Yale’s track coach, proposed that a projecting heel bone commonly found among blacks literally gave them leverage over white sprinters. (Large, 2007, p. 331)

The assistant coach of America’s 1936 Olympic track team, Dean Cromwell, wrote in 1941 that the Negro excels in certain sports “because he is closer to the primitive than the white man. It was not that long ago that his ability to spring and jump was a life-and-death matter to him” (quoted in Large, 2007, p. 331). Even Owens’ athletic coach, Ohio State’s Larry Snyder, believed that Owens’ success and that

of other black sprinters derived from “the striation of the muscles ... and the cell structure of the nervous system.” It also helped, Snyder said, that Negro athletes like Owens were willing to take orders from their white coaches: “Most colored boys take coaching very readily. They have perfect confidence in their coach ... and are willing and glad to leave their training, their form, and their perfection of their technique up to him.” (Large, 2007, p. 331)

In a post-game essay titled “The Real Winners in the 1936 Olympic Games,” Johns Hopkins University professor of experimental physiology, Charles D. Snyder,

insisted that the victories of the American blacks in Berlin did not necessarily undermine the doctrine of overall white supremacy on the athletic field. “Perhaps in the short races,” he wrote, “some anatomical advantages of bone or muscle structure gives the black man an

advantage over the white. In any case, we must remember that the Negro boys were trained by white men in the white men’s institutions.” (Large, 2007, p. 331)

One other theory for why Blacks did so well in sports was because it was

estimated that only one Negro slave in five was able to live through the rigors of the “Middle Passage,” and that the horrible conditions of slavery took toll of many slaves who could [not] make biological adjustments in a hostile environment. One finds the Darwinian theory of the survival of the fittest operating among Negroes as rigorously as any selective process ever operated among human beings. *There is just a likelihood that some very vital elements persist in the histological tissues of the glands or muscles of Negro athletes.* (Quoted in Hoberman, 1997, p. 191; emphasis in original.)

This theory does not explain the superior performance of those many Blacks whose ancestors were never slaves.

The propaganda about superior and inferior races during the 1936 Olympics led to other nations interpreting the performance of athletes within Darwinian racist ideology. For example, “Japan’s military leaders saw their nation’s strong performance in Berlin as a confirmation of Japanese general “racial vitality” and as yet another indication that Japan was destined to replace America and Britain as the chief imperial power in East Asia” (Large, 2007, p. 292). Even the Chinese athletes, although they did not win a single medal in 1936, drew their

own positive “racial lesson” from the Berlin games. In reference to Jesse Owens’s victories, one prominent Chinese journalist wrote that his performance “destroyed the poisonous myth of white supremacy,” while another asked, “Now who says the colored races ... are inferior to the white race?” (Large, 2007, p. 292)

Of note is the “idea that black athletes were more naturally gifted than whites at certain athletic events was not” adopted by the British in spite of their “tradition of manly sports and imperial rule” (Krüger and Murray, 2003, p. 81). Rather, in Britain, Owens was

taken at face value as a splendid individual athlete. The question of confounding or confirming Nazi theories of the “master race” did not occupy the public to any great extent, though it was widely believed that Hitler had snubbed Owens in an unsporting way. The British certainly did not draw the conclusion of some French commentators that they should use their empire to find black athletes to win medals for them. The imperial British amateur was too racially arrogant and too genuinely “sporting” for such a thing. (Krüger and Murray, 2003, p. 81)

The issue of race was given little open prominence in the games themselves. The Japanese sport teams even ignored the problem, partly because Japan is not a multiracial country and, therefore, experienced few racial problems and the Jewish issue was nonexistent in Japan.

The only problem Japan had with the Nazi regime was whether or not the Japanese would be considered a colored race under Nazi law. Matsuzo Nagai, the Japanese ambassador to Germany, called on von Neurath, the minister of foreign affairs, on Oct. 20, 1933. The reason for the meeting was that Nagai wanted to know whether the Japanese were considered a colored race under the bill for amending the criminal law. The minister answered that the Japanese were never considered a colored race. (Krüger and Murray, 2003, pp. 134–135)

Many historians believe that the racist theory of the source of Black athletic ability still exists today. Hoberman writes that one modern ambitious project was

to resurrect the Law of Compensation in the form of zero-sum physiological economy in which “the fast sex hormonal promotion of full sexual differentiation of the body is accompanied by fast maturation of the brain.” And this model leads straight to the classic muscle/mind tradeoff Darwin presented in *The Descent of Man*. (Hoberman, 1997, p. 230)

In 1971, Henry Edwards noted the persisting Darwinian context in which black athletic performances were still interpreted as evidence of retarded development: “So by asserting that blacks are physically superior, whites at best reinforce some old stereotypes long held about Afro-Americans—to wit, that they are little removed from the apes in their evolutionary development.”

One effect of this racist dogma was that

by accepting the stereotype of black athletic superiority, white athletes inflict a crippling psychological handicap on themselves. Finally, by arguing for a cultural rather than a biological interpretation of “race,” ... black athletic superiority results from “a complex of societal conditions” that channels a disproportionate number of talented blacks into athletic careers. (Hoberman, 1997, p. 195)

Summary

The Nazis and the people of many other Western nations rationalized the success of Black athletes by concluding that they were members of “primitive races” that were closer to their animal ape past than the Caucasian races. Consequently, their superior athletic skills, rather than demonstrating their superiority, proved their inferiority!

The prime example, the 1936 Olympics, was “inextricably bound to Hitler’s policies of ‘racial purification’” as was

almost everything else in Nazi Germany (Miller, 1996, p. 131). Nonetheless, the enormous success of Jesse Owens inspired many Blacks to excel in sports, and this factor alone was no doubt important in the athletic success of Black Americans (Edmondson, 2007, p. 37). This history documents that evolutionary ideas are often built on *propaganda* that is popularized through public and media-led endeavors where multiple people, simultaneously receive the propaganda/false ideologies.

The major significance of this study was in demonstrating that Darwinian survival-of-the-fittest ideas were actually visibly negated during the 1936 Olympics through the incredible performances of the Black athletes. But the visible display of Black men fully functioning as the image of God with other men (and doing so with exponential results), was often ignored and instead re-labeled as simply “left-over animal traits.” In reality, their performances were proving the Biblical concept that all men are created in the image of God and no one people group is inferior or superior to any other.

The historical significance of this 1930s connection of sporting events and the performances of different “races” also revealed that Darwinists were a major cause of the spread of racist ideas about people of color—not science fact. In the end, the lesson that can be learned is that Nazi Germany’s adherence to evolutionary theory blinded their eyes to the visible truth being played out in front of them. *Their conclusions proved that racist ideas are simply the delusions of men* who desire to “suppress the truth in unrighteousness” (Romans 1:18). The reality was that the conclusions the Nazis were making about Black athletes were not based on the scientific method but Nazi propaganda. The only way that an idea as absurd as Blacks being athletic because they were closer to their “animal past” could become popular and spread to the world is in the hearts of men who have given themselves over to

false beliefs (Romans 1:28). The 1936 Olympic Games proved the opposite of what the German régime wanted people to believe about human origins. Unfortunately, many people have allowed themselves to be “indoctrinated” by corrupt leadership and the allure of public opinion—much like what is going on in the world today.

Abilities of all humans point to the fact that they were created in the image of God, established by the fact that the Bible simply says “all mankind” were created in God’s image, Genesis 1:26–27. This is significant to the field of Creation Science where we desire to see all men in God’s image, and so desire to discredit evolutionary theory, which has in society displaced God and the evidence for Him, namely His creation.

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Author and Title INDEX for Volume 59, 2022–2023

David V. Bassett*

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), research note (N), letter to the editor (L), book or video review (R), conference abstract (CA), cover photo (CP), or other departments (such as editorials, editor's forum, laboratory director's comments, president's remarks, photo essays, etc.) (D).

2022 CRS Conference Abstracts, 11th
Annual CRS Conference Review
(July 22–23, 2022/ Lynchburg, VA),
176 (CA)

A

Accelerated Decay, Supernovae, and
Uranium, Eugene Chaffin, 178 (CA)

Ahlquist, Jon

Analysis of Natural Selection
Conceptual Inventory Question
Responses among Freshman and
Upper-Class Biology and Pre-Med
Students at a Christian University,
David Boyd, 177 (CA)

Austin, M.J.

Author and Title Index for Volume 59,
2022–2023, David V. Bassett, 51 (D)

B

Baraminic Placement of *Homo*
heidelbergensis Based on Molecular
Data, Matthew Cserhati, 151 (A)

Bassett, David V.
Author and Title Index for Volume
59, 2022–2023, 51 (D)

Baumgardner, John
FEA Analysis of Tsunami
Generation During the Genesis
Flood, 182 (CA)

Language Falsifies Philosophical
Naturalism, 177 (CA)
Modeling the Laramide Tectonics of
Western North America During
the Genesis Flood, 184 (CA)
Modeling the Process of Rapid
Geomagnetic Reversal During
the Genesis Flood, 182 (CA)
Proposed Mechanism for
Megasequence Formation, 184
(CA)

Boyd, David W.
Analysis of Natural Selection
Conceptual Inventory
Question Responses among
Freshman and Upper-Class
Biology and Pre-Med Students
at a Christian University, 177
(CA)

Brenneman, James L.
Proper Bible Interpretation Must
Constrain Creationist Models:
Illustrated by Interpretations of
Genesis 7:11, 177 (CA)

*David V. Bassett, M.S., Cedar Hill, TX

Burgess, Stuart

A Trinitarian Design Methodology Was Used by the Creator When Engineering the Universe, 181 (CA)

Why the Ankle Joint is a Masterpiece of Engineering: And a Rebuttal of Nathan Lents' Bad Design Arguments, 178 (CA)

C

Carter, Robert

A Revised 4D Baramin Concept, 178 (CA)

Multiyear Changes in the Genome of SARS-CoV-2 Reveal a Trend of Degeneration, 183 (CA)

The Central and Southern High Plains Animals Likely Buried in the Flood, Michael J. Oard, 228 (A)

Chaffin, Eugene

Accelerated Decay, Supernovae, and Uranium, 178 (CA)

Choi, Boaz Backsung

What Happened at the Tower of Babel? (Linguistic Evidences for the Historicity of the Tower of Babel Account), 178 (CA)

Comments on Atmospheric Water, Stanley Udd, 186 (L)

Comments on the Review of *The Republican Brain*, William Sabol, 59 (L)

Comments on Williston Basin Oil, John D. Matthews, 187 (L)

Corrado, Jonathan K.

Design Revealed by the Spectral "IR Ledge," 14 (A)

Cordova, Salvador

The Protein Orchard (Rather than a Universal Tree) Is Unwittingly Adopted in Modern Bioinformatics, 179 (CA)

Cserhati, Matthew

Baraminic Placement of *Homo heidelbergensis* Based on Molecular Data, 151 (A)

Mitochondrial Baraminology of Annelida, 179 (CA)

Molecular Baraminology of Primates, 72 (A)

The Uniqueness of Ruminants (Ruminantia) among the Even-Toed Ungulates (Artiodactyla)—Part I: Molecular Baraminology Studies, 142 (A)

D

De Repentigny, Mary Beth

Life on the Edge: The Coming Age of Quantum Biology, 117 (R)

Design Revealed by the Spectral "IR Ledge," Jonathan K. Corrado, 14 (A)

Deweese, Joseph

The Protein Orchard (Rather than a Universal Tree) Is Unwittingly Adopted in Modern Bioinformatics, 179 (CA)

DeYoung, Don B.

Fossils and the Flood, 62 (R)

Did the Floods on Mars Occur During the Genesis Flood?, Michael J. Oard, 184 (CA)

Doane, John

Spinoza's Ghost in the Evangelical Closet, 128 (A)

The "Dolomite Problem" Solved by the Flood, Michael J. Oard, 21 (A)

A Doxological View of Grasses, with Special Attention to Matthew 6:28–30 and Luke 12:27–28, James J.S. Johnson, 114 (P)

E

Evaluating Hypotheses of Hominin Baraminology, Marcus R. Ross, Todd C. Wood, 184 (CA)

Evolution Before Darwin: Theories of the Transmutation of Species in Edinburgh, 1804–1834, David J. Tyler, 255 (R)

Evolution is Modern-Day Alchemy, Charles A. McCombs, 111 (P)

F

FEA Analysis of Tsunami Generation During the Genesis Flood, Tim Lewis, John Baumgardner, 182 (CA)

Fifty-Seven Years of Creation Astronomy—Part 2: Issues and Advances, Andrew Repp, 81 (A)

Fonville, Tate

A Trinitarian Design Methodology Was Used by the Creator When Engineering the Universe, 181 (CA)

Fossils and the Flood, Don B. DeYoung, 62 (R)

G

Geosynchronous Moon Disruption—Modeling an Equatorially Aligned Geomagnetic Dipole With and Without the Moon, Denver Seely, 185 (CA)

Groves, Fred

Williston Basin Comments, 58 (L)

H

- Harbin, Michael A.
The *Tôlēdôt* Structure of Genesis,
223 (A)
- Hebert, III, (Leo) Jake
Scaling in Biology, 60 (R)
Scaling Laws in Biology: Evidence
for Engineering Optimization?,
180 (CA)
Towards a More Realistic Young-
Earth Ice Sheet Model: A
Shallow, Isothermal Ice Ridge
with a Frozen Base, 241 (A)
- Heerema, Stef J.
Regarding the Paper on the
Dolomite Problem, 252 (L)
- Helmkamp, Barbara S.
Latent Heat Could Solve
Accelerated Nuclear Decay's
Heat Problem—Part I, 29 (A)
Latent Heat Could Solve
Accelerated Nuclear Decay's
Heat Problem—Part II, 92 (A)
- The High Mountains Under the
Heavens, Nathan Mogk, 183 (CA)
- Horstemeyer, Mark
A Trinitarian Design Methodology
Was Used by the Creator When
Engineering the Universe, 181
(CA)
When the Holy Spirit's Expression
Is Couched in Terms of
Thermodynamics, a Complete
Mathematical Description of
the Godhead Is Realizable, 180
(CA)

How Old Is Y-Chromosome Adam?
Mutation Rates Give the Answer,
Marshall C. Jordan, 181 (CA)

I

Intelligence, Information, and
Thermodynamics, Andy McIntosh,
183 (CA)

J

- Johnson, James J.S.
A Doxological View of Grasses, with
Special Attention to Matthew
6:28–30 and Luke 12:27–28,
114 (P)
Rock Wrens: Living Life on the
Rock, 57 (P)
- Jordan, Marshall C.
How Old Is Y-Chromosome Adam?
Mutation Rates Give the
Answer, 181 (CA)
Tracing Neanderthal Descent from
Noah Using Ancient DNA, 181
(CA)

K

- Katzaman, Eric
Modeling the Process of Rapid
Geomagnetic Reversal During
the Genesis Flood, 182 (CA)
- Klevberg, Peter
Klevberg Reply to Matthews, 190 (L)
Petrified Ideas of the Williston
Basin—Part III: Coal and Oil,
39 (A)
A Quantitative Assessment of the
Genesis Flood Rock Record:
Colorado as a Pilot Study, 217
(A)
Where the Sediments Are, 103 (A)
Why the Sediments Are There—Part
2: A Flood Regression Model,
160 (A)

Klevberg Reply to Matthews, Peter
Klevberg, 190 (L)

L

- Language Falsifies Philosophical
Naturalism, John Baumgardner, 177
(CA)
- Latent Heat Could Solve Accelerated
Nuclear Decay's Heat Problem—
Part I, Barbara S. Helmkamp, 29 (A)
- Latent Heat Could Solve Accelerated
Nuclear Decay's Heat Problem—
Part II, Barbara S. Helmkamp, 92
(A)
- Lee, Nayeon
Material Design Found in Ironclad
Beetles' Exoskeleton, 182 (CA)
- Lewis, Tim
FEA Analysis of Tsunami
Generation During the Genesis
Flood, 182 (CA)
- Life on the Edge: The Coming Age of
Quantum Biology*, Mary Beth De
Repentigny, 117 (R)
- Lightner, Jean K.
The Uniqueness of Ruminants
(Ruminantia) among the
Even-Toed Ungulates
(Artiodactyla)—Part I:
Molecular Baraminology
Studies, 142 (A)
The Uniqueness of Ruminants
(Ruminantia) among the
Even-Toed Ungulates
(Artiodactyla)—Part II: Unique
Anatomical and Physiological
Traits, 200 (A)
- Liu, Ying
Multiyear Changes in the Genome
of SARS-CoV-2 Reveal a Trend
of Degeneration, 183 (CA)

M

Mammalian Megafauna, Bone Beds of North America: Agate Fossil Beds National Monument and Cite Canyon, Texas, Don McClenagan, 4 (A)

Material Design Found in Ironclad Beetles' Exoskeleton, Nayeon Lee, 182 (CA)

Matthews, John D.
Comments on Williston Basin Oil, 187 (L)
Regarding the Paper on the Dolomite Problem, 252 (L)

McClenagan, Don
Mammalian Megafauna, Bone Beds of North America: Agate Fossil Beds National Monument and Cite Canyon, Texas, 4(A)

McCombs, Charles A.
Evolution is Modern-Day Alchemy, 111(P)

McIntosh, Andy
Intelligence, Information, and Thermodynamics, 183 (CA)
A Trinitarian Design Methodology Was Used by the Creator When Engineering the Universe, 181 (CA)

Modeling the Laramide Tectonics of Western North America During the Genesis Flood, Savannah Robins, John Baumgardner, 184 (CA)

Modeling the Process of Rapid Geomagnetic Reversal During the Genesis Flood, Eric Katzaman, John Baumgardner, 182 (CA)

Mogk, Nathan
The High Mountains Under the Heavens, 183 (CA)
Oceanfront Property in Arizona: Flood Terminal Boundary at the Top of Neogene Basin Fills, 183 (CA)

Molecular Baraminology of Primates, Matthew Cserhati, 72 (A)

Multiyear Changes in the Genome of SARS-CoV-2 Reveal a Trend of Degeneration, Ying Liu, Robert Carter, 183 (CA)

N

Navarro, Evan Arthur
Proposed Mechanism for Megasequence Formation, 184 (CA)

O

Oard, Michael J.
The Central and Southern High Plains Animals Likely Buried in the Flood, 228 (A)
Did the Floods on Mars Occur During the Genesis Flood?, 184 (CA)
The "Dolomite Problem" Solved by the Flood, 21 (A)
A Quantitative Assessment of the Genesis Flood Rock Record: Colorado as a Pilot Study, 217 (A)
Reply to Heerema and Matthews, 253 (L)
Where the Sediments Are, 103 (A)
Why the Sediments are There—Part 2: A Flood Regression Model, 160 (A)

Oceanfront Property in Arizona: Flood Terminal Boundary at the Top of Neogene Basin Fills, Nathan Mogk, 183 (CA)

Q

A Quantitative Assessment of the Genesis Flood Rock Record: Colorado as a Pilot Study, John K. Reed, Michael J. Oard, and Peter Klevberg, 217 (A)

P

Petrified Ideas of the Williston Basin—Part III: Coal and Oil, Peter Klevberg, 39 (A)

Proper Bible Interpretation Must Constrain Creationist Models: Illustrated by Interpretations of Genesis 7:11, James L. Brenneman, 177 (CA)

Proposed Mechanism for Megasequence Formation, Evan A. Navarro, John Baumgardner, 184 (CA)

The Protein Orchard (Rather than a Universal Tree) Is Unwittingly Adopted in Modern Bioinformatics, Salvador Cordova, Joseph Deweese, John Sanford, Henry Wittler, 179 (CA)

R

The Receding Phase of the Genesis Flood: Exegetical and Geological Notes on Genesis 8:1–12, Jeffrey P. Tomkins, 207 (A)

Reed, John K.
A Quantitative Assessment of the Genesis Flood Rock Record: Colorado as a Pilot Study, 217 (A)
Where the Sediments Are, 103 (A)
Why the Sediments are There—Part 2: A Flood Regression Model, 160 (A)

Regarding the Paper on the Dolomite Problem, Stef J. Heerema and John D. Matthews, 252 (L)

Reply to Heerema and Matthews, Michael J. Oard, 253 (L)

Repp, Andrew
Fifty-Seven Years of Creation Astronomy—Part 2: Issues and Advances, 81 (A)

A Revised 4D Baramin Concept, Robert Carter, 178 (CA)

Robins, Savannah
Modeling the Laramide Tectonics of Western North America During the Genesis Flood, 184 (CA)

Rock Wrens: Living Life on the Rock, James J.S. Johnson, 57 (P)

Ross, Marcus R.
Evaluating Hypotheses of Hominin Baraminology, 184 (CA)

S

Sabol, William
Comments on the Review of *The Republican Brain*, 59 (L)

Sanford, John
The Protein Orchard (Rather than a Universal Tree) Is Unwittingly Adopted in Modern Bioinformatics, 179 (CA)

Scaling in Biology, Jake Hebert, 60 (R)

Scaling Laws in Biology: Evidence for Engineering Optimization?, Leo (Jake) Hebert, III, 180 (CA)

Seely, Denver
Geosynchronous Moon Disruption-Modeling an Equatorially Aligned Geomagnetic Dipole With and Without the Moon, 185 (CA)
Stronger Pre-Flood Geomagnetic Radiation Shielding May Account for Lack of Rain and Rainbows, 185 (CA)

Spinoza's Ghost in the Evangelical Closet, John Doane, 128 (A)

Stronger Pre-Flood Geomagnetic Radiation Shielding May Account for Lack of Rain and Rainbows, Denver Seely, 185 (CA)

T

Tomkins, Jeffrey P.
The Receding Phase of the Genesis Flood: Exegetical and Geological Notes on Genesis 8:1–12, 207 (A)

Towards a More Realistic Young-Earth Ice Sheet Model: A Shallow, Isothermal Ice Ridge with a Frozen Base, Jake Hebert, 241 (A)

Tracing Neanderthal Descent from Noah Using Ancient DNA, Marshall C. Jordan, 181 (CA)

A Trinitarian Design Methodology Was Used by the Creator When Engineering the Universe, Mark Horstemeyer, Tate Fonville, Andy McIntosh, Stuart Burgess, 181 (CA)

Tyler, David J.
Evolution Before Darwin: Theories of the Transmutation of Species in Edinburgh, 1804–1834, 255 (R)

U

Udd, Stanley
Comments on Atmospheric Water, 186 (L)

The Uniqueness of Ruminants (Ruminantia) among the Even-Toed Ungulates (Artiodactyla)—Part I: Molecular Baraminology Studies, Jean K. Lightner and Matyas Cserhati, 142 (A)

The Uniqueness of Ruminants (Ruminantia) among the Even-Toed Ungulates (Artiodactyla)—Part II: Unique Anatomical and Physiological Traits, Jean K. Lightner, 200 (A)

W

What Happened at the Tower of Babel? (Linguistic Evidences for the Historicity of the Tower of Babel Account), Boaz Baeksung Choi, 178 (CA)

When the Holy Spirit's Expression Is Couched in Terms of Thermodynamics, a Complete Mathematical Description of the Godhead Is Realizable, Mark Horstemeyer, 180 (CA)

Where the Sediments Are, John K. Reed, Michael J. Oard, Peter Klevberg, 103 (A)

Why the Ankle Joint Is a Masterpiece of Engineering: And a Rebuttal of Nathan Lents' Bad Design Arguments, Stuart Burgess, 178 (CA)

Why the Sediments Are There—Part 2: A Flood Regression Model, Michael J. Oard, John K. Reed, and Peter Klevberg, 160 (A)

Williston Basin Comments, Fred Groves, 58 (L)

Wittler, Henry
The Protein Orchard (Rather than a Universal Tree) Is Unwittingly Adopted in Modern Bioinformatics, 179 (CA)

Wood, Todd C.
Evaluating Hypotheses of Hominin Baraminology, 184 (CA)



Notes from the Panorama of Science

A Tipping Point for Identifying Milankovitch Cycles in Rocks

The geological literature is well-supplied with papers claiming that the timescales for the sedimentation of many layered rocks has been determined objectively. Researchers have identified patterns in rock formations that correlate with known astronomical cycles. The cycles relate to orbital precession (P), obliquity (O), and orbital eccentricity (E). These are known as the Milankovitch cycles, which in theory affects the distribution of sunlight on Earth over many thousands of years and controls the timing of presumed glacial cycles.

Many geologists have devoted their careers to cyclostratigraphy, which is the name given to the identification of astronomical signals in sedimentary sequences. Over past decades, this approach has been an essential part of the toolbox used by sedimentologists analyzing data from Quaternary and Neogene sources, and sometimes even “older” layers. In the 1990s, cyclostratigraphy was used to match orbital cycle chronologies with measured sedimentary cycles and oxygen isotope curves. According to the textbook by Weedon (2003, p. 3):

“The results were at odds with the widely accepted radiometric ages that had been obtained using potassium-argon dating. Subsequently, improved radiometric dating and studies of sea-floor spreading rates confirmed the validity and utility of the so-called astronomical time scale approach. Consequently, a recent geochronometric scale for part of the Neogene has been based directly on orbital-cycle chronology rather than the traditional data derived from

radiometrically calibrated rates of sea-floor spreading.”

Confidence in the methodology has boosted research initiatives, with a worthy goal of bringing more objectivity to the discussion of sedimentation rates. Great claims are made about the refined geochronologies that have emerged from such studies. The primary cycles are 100,000 years (eccentricity), 41,000 years (obliquity), and 23,000 years (precession). The main targets for empirical data are oxygen isotopes ($\delta^{18}\text{O}$, as a proxy for global ice volume), carbon dioxide ($p\text{CO}_2$, tracking greenhouse gas concentrations), and lamination thickness (associated with rates of sedimentation). Weedon (2003) drew attention to the significance of a book by Schwarzacher (1975, p. 4) which he describes as representing “a landmark in the examination of sedimentary cyclicity”:

“Instead of just examining the transitions between lithologies at bed boundaries in Markov chain analysis, he reasoned that the thickness of successive beds provided information of fundamental importance in the assessment of sedimentary cycles. This meant that the stratigraphic data should be collected as time series.”

In addition to thickness data, measurements of calcium carbonate (CaCO_3) and total organic carbon (TOC) may also be gathered to contribute to the time series changes.

Despite the successes of the Milankovitch theory, there is a growing literature expressing disquiet. For example, Muller and Macdonald (1997, p. 215)

found some of the Ice Age data to be anomalous:

“Two million years ago, the cycles match the 41,000-year period of Earth’s obliquity. This supports the Croll/Milankovitch theory, which attributes the cycles to variations in insolation. But for the past million years, the spectrum is dominated by a single 100,000-year feature and is a poor match to the predictions of insolation models.”

Berger (2012, p. 1) found the prominence of the eccentricity cycle to be problematic:

“The chief problem arising has to do with the prominence of a cycle near 100,000 years, whose origin is not clear.”

These issues are discussed by Oard (2007).

More recently, concern has been expressed about the statistical techniques used to process the data, particularly the practice of “tuning.” Puetz et al. (2016, p. 159) describe it with these words:

“Supposing that the sedimentation of stratigraphic data was subject to Milankovitch insolation forcing (but also to jitters in the deposition rate), one might try to determine the depth–age mapping that makes the data cohere best with the insolation curve or some related target. One way to tune the depth–age mapping is to optimize, over a variety of jitters, the least squares fit of the target curve to the data. If the coherence of the tuned data and the target is very strong, it justifies the tuning *a posteriori*.”

Another way of expressing this is that researchers bring hidden assumptions (consciously or unconsciously) to their work. The assumptions presume the validity of the theory, and the published results “confirm” the soundness of their analysis. The issue of tuning elicited an alarm from Weedon (2022), who identified practices leading to “unacceptably high rates of false detection of regular cyclicity,” an outcome described as “Type I errors.” Tuning has been discussed by Hebert (2014).

The issue has come to a head in a recent article by Bailey (2023, pp. 105–106), who declares:

“Cyclostratigraphy appears to have reached a tipping point, where the results of methods widely used in its 40-year heyday must now be discounted. There have been decades of false cycle identifications that have provided the seemingly powerful, but erroneous, basis for the acceptance of ubiquitous orbital influence on accumulation; and for rejection of arguments stressing the essential randomness of lithostratigraphical time series.”

As analysed by Bailey (2023, p. 103), the cyclostratigraphers face the problem of confirmation bias. From the outset, the researchers have assumed that the sediments would carry a Milankovitch signature:

“The term ‘cycle’ was thus increasingly applied to those repetitive changes in the stratigraphical record that had, *or were inferred to have*, periodicity, that is, a regular *time* significance. It involved the belief that regardless of age and location of the section, there is likely to be a detectable, periodic, orbitally-induced climatic imprint on lithostratigraphical layering.”

This belief influenced the development of a research methodology that incorporated tuning:

“Cyclostratigraphy was then formalised as a methodology that deals

with the identification, characterization, correlation and interpretation of cyclic variations in the stratigraphical record. It adopts the ‘expected universe’ in which even spatially irregular patterns of lithological recurrence may denote orbitally-forced periodicity in sedimentation, leading to a so-called astrochronology.” (Bailey, 2023, p. 103)

Data sets analysed using this methodology invariably carried extensive noise, but the presumption was that the cycles were present, waiting to be identified:

“The spectral analysis of the data in the time domain should, strictly, be suspect, since, in the absence of an independently-determined time-frame, it adopts a relationship that it should set out to prove. In fact, random data-series if tuned in this fashion will inevitably find enhanced spectral power (a strong peak) corresponding to the tuning frequency. With real lithostratigraphical data, the process is judged to be successful only if it reveals that other frequency components of the orbital (P, O, E) imprint are present, though, as now will be shown, the widely-used statistical criteria for distinguishing signal from noise in stratigraphical data series make false cycle detection inevitable.” (Bailey, 2023, p. 103)

Bailey (2023, p. 103) goes on to look more closely at this methodology, but finds it wanting:

“Whether or not tuning was employed, most of the spectrally-derived astronomical cycle detections, published in the last 25 years prove to have been statistically flawed, detecting improbably large numbers of cycles, some or all of which are not, in fact, present in the analysed data-series. This means that the ‘astrochronological’ time calibrations that are supported by these detections are nullified.”

Bailey is not a lone voice, and this is not his first contribution on the topic.

Disquiet has rumbled on for years, including dissent among geologists who are not using cyclostratigraphy. An instance of this became apparent at a geological conference I attended recently. The keynote speaker spoke about a project with the title: “Early Jurassic Earth System and Timescale (JET).” An abstract prepared for an earlier conference is by Hesselbo (2021). The research involved gathering data from two boreholes drilled through British Lower Jurassic rocks. The project aim included the construction of an astronomically-calibrated integrated timescale for the Early Jurassic. It emerged that the duration of the Hettangian (the basal stage of the Lower Jurassic) was 2 Ma. In the discussion, it was pointed out that the International Commission on Stratigraphy figure is currently 4.2 Ma, and that this is derived from an ammonite stratigraphy, also calibrated by orbital data (Weedon et al., 2019)! I discussed this clear internal contradiction afterwards with a paleontologist. I made a comment about the signal-to-noise ratio being very low, and that modern depositional environments do not show slow, continuous sedimentation. The paleontologist, quite correctly, responded that it is incoherent to think that stable rates of sedimentation could persist over just thousands, let alone millions, of years. The take-home message is that dating sediments using astronomical cycles is fraught with circular reasoning and contradictions are inevitable.

A major critique of the methodologies of cyclostratigraphy is by Smith (2023). Based on an analysis of 60 cyclostratigraphic studies published in the period 2018–2020, he finds major issues with all of them. In many ways, Smith provides concrete examples that illustrate the points raised by Bailey. The situation is serious: the methodologies are an expression of a research paradigm that needs radical revision.

“Challenging such a highly productive paradigm may be unpopular, but it is time to confront two possibilities:

that mathematically true cyclicity is less prevalent in stratigraphic successions than published results suggest; and that the conventional spectrum-with-confidence limits creates more candidate orbital cycles than it discovers: it is in fact an Orbital Cycle Factory.” (Smith, 2023, p. 1)

In other words, the methodology is designed to find orbital cycles, and it will produce a publishable outcome analogous to a factory producing goods.

In the past decade, the CRSQ has contributed to critiques of using Milankovitch cycles to explain geological phenomena. Hebert (2017) has focused on Quaternary geology by reworking data and showing the foundations are of sand. Reed and Oard (2015, 2016) have discussed the background to cyclostratigraphy, and Oard and Reed (2020) have provided a critique of unresolved problems. Now that we have Bailey, Weedon, and Smith sounding alarms about the presumption of astronomical forcing, there is encouragement to think that significant change is on the way.

However, the abiding appeal of Milankovitch-inspired cyclostratigraphy is that it seems to offer objectivity and robustness. Sedimentologists want to work with it because it appears to give substance to research papers. In the words of Puetz et al. (2016, p. 159): “Milankovitch Theory now offers a seductively elegant solution to the problem of age-stratum mapping.”

David Tyler

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Letters to the Editor

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

Regarding Reed et al., 2023—The Flood-Derived Rock Column in Colorado

Reed et al. (*Creation Research Society Quarterly* 59(4):217–227, 2023) have endeavoured to quantify the volume and distribution of “... the rock record of the Deluge” (p. 218) in Colorado, as “... a necessary step in contributing to a comprehensive Flood model” (p. 218). They designate the “... mapped Precambrian surface...” (p. 220) in Colorado, which they note is the “... unconformity at the top of the Precambrian...” (p. 220), as their lower boundary of Flood-deposited strata or “...lower diluvial boundary” (p. 220), and take the top of the Tertiary, at the present-day topographic surface, as their “... upper diluvial boundary” (p. 220). They thereby estimate the total volume of the “... Flood derived rock column” (p. 221) in Colorado at 521,391 km³, giving an average thickness of 1,934 meters over the total area of the state.

Noting that “...small volumes of Precambrian sedimentary and metasedimentary rocks” (p. 220), including quartzite and sandstone sequences up to 7.3 km thick in the Uinta Mountains, outcrop in several areas in Colorado, they exclude all Precambrian rocks from their estimate of diluvial strata, on the basis of their small outcrop areas compared to the volume of overlying Phanerozoic sedimentary rocks.

Notwithstanding the small outcrop areas of Precambrian rocks in Colorado, outcrop mapping, seismic surveys, aeromagnetic surveys, and drilling have confirmed the existence of extensive Precambrian sedimentary, metasedi-

mentary, volcanic, and metavolcanic rocks beneath the Phanerozoic strata. Tweto (1987) notes that Precambrian basement rocks, which he takes as applying to “... all rocks of Precambrian age” (Tweto, 1987, p. 41) in Colorado, are exposed in mountain uplifts throughout the western three-fifths of the state and constitute less than 15 percent of the total area of the state. In the remaining 85 percent of the state, Tweto notes: “... a Precambrian basement of the same general character as that exposed in the uplifts lies at various depths beneath a cover of younger rocks” (Tweto, 1987, p. 2; emphasis added). Some 50 percent of these Precambrian rocks in Colorado are stratified sedimentary, metasedimentary, volcanic, and metavolcanic rocks, the stratigraphic relationships of which have been established by several workers (Figure 1), including Tweto (1987) who describes the Precambrian strata of Colorado, from oldest to youngest, as follows:

Archean: The *Owiyukuts Complex* comprises granite gneiss, quartzo-feldspathic gneiss, garnet gneiss, biotite gneiss, migmatite and garnet amphibolite, mainly of granitic composition and igneous (Graff et al., 1980; Sears et al., 1982). The estimated thickness of the *Owiyukuts Complex* is approximately 2.0 km. The *Red Creek Quartzite* comprises metaquartzite, quartz-muscovite and chlorite schists, and minor marble (Hansen, 1965; Graff et al., 1980). The estimated thickness of the *Red Creek Quartzite* is 4.0 km.

Upper Lower Proterozoic: The “*Gneiss Complex*” is a complex of metasedimentary and metavolcanic biotitic gneisses, derived mainly from sedimentary rocks, and felsic and hornblende gneisses, largely derived from volcanic lavas and tuffs. The Complex includes the *Irving Formation* (Barker, 1969) and the *Twilight Gneiss* (Barker, 1969) and is “... part of an extensive province of Early Proterozoic rocks that extends southward from the Wyoming Archean province through Colorado into New Mexico and Arizona and beyond” (Tweto, 1987, p. 10; emphasis added). Biotitic gneisses comprise “... great, though unknown thicknesses” (Tweto, 1987, p. 11) of mainly gneisses, with interbedded mica schists, quartzites, conglomerates, and calc-silicate rocks including marble. The bedded and cross-bedded quartzites comprise four thick layers up to 1,100 m thick, which are separated by layers of mica schist. Felsic and hornblende gneisses derived from intimately interlayered sedimentary and felsic and mafic volcanic rocks are widespread. The source rocks for the felsic gneisses are thought to be tuffs, principally rhyodacites and quartz latites. Extensive interlayered metasedimentary and metavolcanic rocks occur in the Arkansas River area where the felsic to mafic metavolcanics are derived from tuffs, breccias, and lava flow units. Rhyodacitic, possibly welded, metatuffs contain flattened pumice fragments, lithic fragments, and compactional banding. Metasedimentary rocks include metaquartzites, metagraywackes,

and metasilstones, which show graded bedding, cross-bedding, and primary breccia textures. Unmetamorphosed sedimentary rocks include conglomerates and banded iron formation. Dacitic to rhyolitic felsic metatuffs with eutaxitic texture, recrystallized pumice lapilli, crystal fragments, and primary brecciation, evidencing explosive volcanic activity, occur in the Gunnison area.

Associated metabasalts with pillow structures, indicating submarine extrusion, metagreywackes, metasilstones, and metacherts with clastic textures and graded bedding, and thin quartzite beds also occur.

Lower Middle Proterozoic: The *Vallecito Conglomerate* and *Uncompahgre Formation*, which occur in the Needle

Mountains area of southwestern Colorado, are considered as lateral facies variations of each other. The *Vallecito Conglomerate* (Burns et al., 1980) comprises "... a massive unit of conglomerate, pebbly quartzite, and quartzite at least 1,525 m ...thick" (Tweto, 1987, p. 18) which contains local phyllite and schist beds. Conglomerate clasts comprise vein quartz, quartzite, chert,

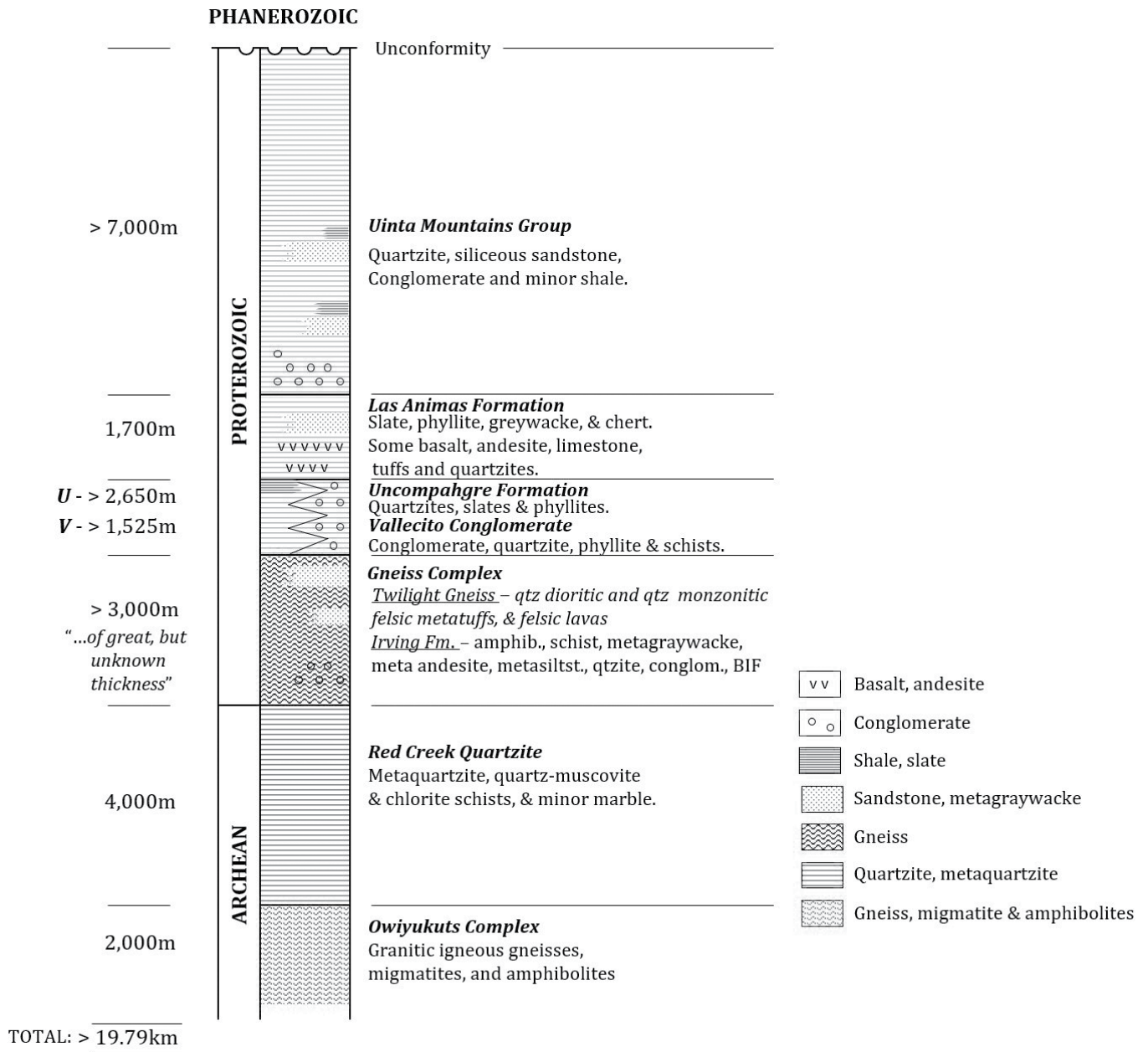


Figure 1. Stratigraphic column for the Precambrian of Colorado).

jasper, and banded iron formation. Also present near the base of the formation are amphibolite, schist, gneiss, and greenstone. The *Uncompahgre Formation* (Barker, 1969; McKnight, 1974) is “... a thick sequence of quartzites, slates, and phyllites exposed in scattered localities in the vicinity of the western San Juan Mountains in southwestern Colorado” (Tweto, 1987, p. 19; emphasis added). In the type area, in the Uncompahgre River, a thickness of at least 2,650 meters of the formation is exposed.

Middle Proterozoic: The *Las Animas Formation* (Tweto, 1983), known from several deep bore holes, comprises “...a thick sequence of moderately metamorphosed sedimentary and volcanic rocks that lies beneath the plains of southeastern Colorado...” (Tweto, 1987, p. 20; emphasis added). One deep borehole penetrated 1,270 m into the formation without reaching the base. The Formation comprises dark gray and black slate, phyllite, fine-grained graywacke, and chert, and some basalt, andesite, and carbonate rocks (mainly limestone with some dolomite, latite, and dacitic-to-rhyolitic devitrified tuffs and quartzites in some bore holes).

Middle Proterozoic: The *Uinta Mountain Group* (Hansen, 1965) comprises a more than 7-km thickness of unmetamorphosed and only locally deformed quartzite and siliceous sandstone accompanied by thick wedges of conglomerate and subordinate shale.

We see then that the Precambrian sedimentary, metasedimentary, volcanic, and metavolcanic strata which occur extensively beneath the Phanerozoic throughout Colorado are at least ~20.0 km thick (Figure 1). These rocks evidence widespread destructive volcanic and sedimentary geological activity during deposition of the Precambrian in Colorado. Metatuffs, lapilli, and crystal fragments in the Gneiss Complex evi-

dence atmospheric ash/tephra clouds associated with explosive volcanic activity and pillow structures in basalt lava flows indicate submarine extrusion.

In Hunter (2022), I documented evidence of widespread massive destructive volcanic, including explosive volcanic, activity throughout the global Precambrian rock record, including the earliest Precambrian. Globally, Precambrian rocks include pyroclastic flows comprising hot gases and tephra (ash and dust) at 300 to 400°C, moving at up to 180 km/hr and ejected from explosive volcanic eruptions, tuffs comprising ash ejected from explosive eruptions and including lithic and crystal fragments, and accretionary lapilli and lapillistone formed by accretion around condensing water droplets of fine airborne ash from explosive volcanic eruptions. Ignimbrites (pumiceous pyroclastic flows) form some of the largest eruptive accumulations known, up to 1,000 km³, and are described as “...the most cataclysmic of all geological phenomena” (Cas & Wright, 1987, p. 223; emphasis added).

Globally the Precambrian, and especially the lowest Precambrian, comprises very thick accumulations of volcanic and volcanosedimentary rocks. Annhaeusser (1971) illustrated the main components of fully developed Archean greenstone belts. These comprise (1) a basal *Ultramafic Group*, typically 7.5 km thick, comprising ultramafic peridotitic and mafic basaltic high-temperature komatiites, tuffs, and tholeiitic lavas, (2) a *Greenstone Group*, typically 7.2 km thick, comprising mafic basalts, andesites, dacites, and felsic rhyodacites and rhyolites, pyroclastics, cherts, banded ironstones and jaspilites, and (3) a terminal *Sedimentary Group*, typically 3.5 to 5.25 km thick comprising sandstones, shale, grit, conglomerate, chert, banded ironstone, jaspilite, and minor volcanic and pyroclastic rocks. Greenstone belts include very thick volcanosedimentary accumulations, up to 30.0 km thick in Western Australia, greater than 20.0 km

thick in the Barberton Belt of South Africa, and up to 12.0 km thick in the Canadian Shield. The Archean lower *Pilbara Supergroup* of Western Australia was constructed through the accumulation of eight repeated ultramafic to felsic lava flow cycles, each varying in thickness from 1.00 to 5.85 km., for an aggregate thickness of 21.85 km.

I concluded that such massive destructive volcanic, including explosive volcanic, activity would not have been occurring during Creation Week, a week of perfect creation, or during the antediluvian period. All of the Precambrian, I concluded, must therefore be Flood-deposited. This conclusion, I suggested, is corroborated by the Scriptural record of God’s revelation to Noah that the created Earth (*éretz*) had been destroyed by the Flood, when He declared “...never again shall there be a flood to destroy the earth” (Genesis 9:11). If the created Earth (*éretz*) was destroyed by the Flood then none of the Precambrian can be Creation Week deposits. Oard (2023) has also concluded that; “...most, if not all, Precambrian sedimentary and metasedimentary rocks and associated volcanic rocks are from the Flood.” (Oard, 2023, p. 29; emphasis added). Reed et al. note that their method of calculating the volume of Flood-deposited strata in Colorado “... allows for recalculation for revised or alternate boundaries” (Reed et al., 2023, p. 217). Accordingly, I suggest the “lower diluvial boundary” in Colorado must be at least as deep as ~20.0 km., the thickness of the Precambrian of Colorado as described by Tweto (1987), and the volume Flood-deposited strata in Colorado must be significantly greater than that calculated by Reed et al. Tweto (1987) notes that seismic investigations indicate that the siliceous upper crust in Colorado is about 28 km thick. He also notes that Colorado occupies part of the *North American Craton*, which is characterized by “a sialic or continental-type crust that was formed in Precambrian time” (Tweto, 1987, p. 3;

emphasis added) and that, in Colorado, "...the total crust is about 48–50 km... thick, ..." (Tweto, 1987, p. 3; emphasis added). Thus, if all the Precambrian is Flood-deposited, the "...lower diluvial boundary" must be at least 48–50 km deep in Colorado.

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Main Goals of the Creation Movement

I have in the past noted the goals of some creation movements appear not to support what most of us regard as important and/or are sometimes even contrary to the movement. For this reason, several of us have attempted to draft a set of goals that can be useful in focusing our energies toward the heart of our concerns.

The 'Main Goal'

The 'Main Goal' of the creation movement is to remove the philosophical and/or scientific obstacles to accepting Christ (2 Corinthians 10:5), especially those regarding the foundational worldview issue of origins. A major well-documented reason for rejecting both Christianity and creationism is the acceptance of

evolutionism (Bergman, 2019a). Before Darwin, virtually every Western naturalist and other highly educated persons were creationists. As I have documented in six books and over a thousand articles, after the time of Darwin, the vast majority of scientists have become evolutionists and most leading scientists are now functional atheists (Bergman, 2019a,

2019b, 2020a, 2023, 2023c, 2023d). Considering Christ for them is, in most cases, not even a viable option. This barrier must be removed to consider a theological option.

How this 'Main Goal' is achieved

- Document the fact that evolution has never happened, and could never have happened, by showing that the false claims of abiogenesis, natural selection, and random mutations actually effectively disprove Darwinism. This is also true of the other pillars of evolution, including homology, convergent evolution, endosymbiosis, and the useless organ and poor-design claims (Bergman, 2017a, 2019c, 2019d, 2019e, 2022, 2022a).
- Focus on human evolution, the major concern affecting belief in Adam and Eve and original sin (Bergman, et al., 2020; Bergman, 2023b).
- Document the harm that Darwinism has done in society (the breakdown of morals, racism, Nazism, Communism, WWI, WWII, Vietnam, Korea, etc.) (Bergman, 2012, 2017, 2019, 2020a, 2021, 2023a, 2023c). The reason for this focus is many Christians do not see believing in both creation and evolution as a problem.
- Build the case for creationism by documenting the impossibility of molecules-to-man evolution and the evidence for design in the natural world as supported by concepts such as irreducible complexity of function and interdependence of structure.
- Defend historical events, such as a recent creation and the reality of the worldwide Flood of Genesis 6–8.
- Support our co-workers in the creation movement, especially those

who face opposition which results in impediments in earning their livelihood (Bergman, 2012a, 2018, 2019). This includes academics denied degrees or terminated due to their heterodox conclusions about origins.

Jerry Bergman

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Media Reviews



Dragonflies and Damselflies – a Natural History

by Dennis Paulson

Princeton University Press,
Princeton, NJ, 2019,
224 pages, \$29.95

In recent years, there has been a decided increase in dragonfly watching to complement the ongoing interest in bird and butterfly observations. Dragonflies are found all around the world except Antarctica, so everyone has opportunities to be amazed by these creatures with their superlative flying abilities and enormous eyes. But there is much more amazement concerning these aerial acrobats.

Author Paulson is eminently qualified to be our guide. He is a leading expert on these insects having studied them worldwide. Paulson has written more than 50 scientific papers and authored major field guides on insects found in the eastern and western United States. In this handsome book, the author not only details their anatomy and behaviors, but also shares over 200 astounding photos of these winged beauties.

The book is well written and accessible to the general reader with a glossary, an index, and references to additional resources on this topic including numerous websites. There are

six chapters, the first five each followed by 11 species profiles, which include photos, size, distribution, habitat data, and comments. It seems that every one of those 55 profiles describes a species with a unique feature. There is an enormous amount of variation within these insects! After the final chapter, there is a photo of a representative of each of the 39 families.

Dragonflies and damselflies are both included in the taxonomic order Odonata and are referred to as odonates. Dragonflies make up suborder Anisoptera, Damselflies are in suborder Zygoptera, and there are three living species in suborder Anisozygoptera. Paulson states that, at the time of writing, there are 6,308 known species of Odonata (p. 5).

Throughout the book, Paulson occasionally mentions evolution as fact. However, he never expresses animosity toward creationism. In fact, creation is never mentioned nor is there any credit ascribed to the Creator for these insects. This is sad considering how much they glorify their Maker. Paulson claims that Odonates are "...in a group of aquatic insects ... that were the first insects to take flight" (p. 10). Also, "Dragonflies

and damselflies have been around for at least 250 million years..." (p. 9). Yet he declares that "dragonflies are the best insect fliers, superlative in terms of high top speeds, extreme maneuverability, and the ability to hover for long periods. Their wings have been described as organs that have optimized their mechanical structure and their biological function" (p. 50). Chance evolution supposedly starts simple and proceeds to complex, yet the best insect fliers seem to have evolved very early. I believe Paulson is correct, if we take him literally, that "Odonate wings are miracles of construction" (p. 50). He adds, "Odonates can beat each of their four wings independently which provides a maximum of aerial agility" (p. 52). How the miniscule dragonfly brain can coordinate those four wings for precise, split-second maneuvers is an additional wonder.

Paulson relates how biomimicry of dragonfly flight for drones is a field of "... research [that] is still in its infancy" (p. 167). Obviously, this ability is extremely sophisticated, unlike what one would expect from the product of chance. In the recent science fiction movie, *Dune*,

humans fly about in machines which mimic dragonflies.

Paulson also details the wonders of dragonfly vision, essential for highly controlled flight. “In larger species, each of the compound eyes contains up to 30,000 simple eyes, more than in any other insect group” (p. 54). “Their large eyes allow them just about total vision in all directions” (p. 54).

The first section of chapter one is titled, “Odonate Classification and Evolution.” Paulson does not speculate about what odonates supposedly evolved from. In an earlier work, *The Biomechanics of Insect Flight* (2002), author Dudley states, “Unfortunately, the evolutionary origins of flight in insects are not well known. Paleontological records of transitional forms are absent ... precluding any paleobiological interpretation of this major event in metazoan evolution” (p. 261). The tiny suborder Anisozygoptera, consisting of only three species, is no help in any attempt to elucidate odonate evolution. Paulson states that the three species “... are true relics, not related to any other living species...” (p. 11).

The last section of the final chapter is titled, “Phylogeny,” dealing with attempts to construct an evolutionary tree of the odonate families. Much work has been done recently in this regard, especially with DNA studies. A well-established cladogram has been assembled for Anisoptera (p. 203), but there is still work to be done for Zygoptera. Interested creationists could study these insects in an attempt to determine the original kinds and which modern species diversified from which ancestral kinds. I think the few dozen species en-

demic to remote Hawaii (p. 201) would be especially interesting in this regard.

A dragonfly of special interest to creationists would be the Scarlet Dwarf (p. 84). This diminutive (length about 1.7 cm.) dragonfly, though small, has a wide distribution on many islands between China and Papua New Guinea. Paulson finds it puzzling how this insect could have been thus distributed. Its flying ability is inadequate for crossing such wide stretches of ocean between islands. Former ice age land bridges could explain some of their current distribution, but not all. The floating logmat theory could possibly explain their present range.

Dragonflies known as shutwings, unlike almost all other dragonflies, close their wings when at rest. “[T]he evolution of this peculiarity in the shutwings, the only other dragonflies that hold their wings closed [in addition to South American sapphirings that perch with closed wings during just part of their life] among more than 3,000 species that hold them open, defies understanding” (p. 118). Then there is the Black Velvetwing, the only damselfly of about 3,200 species that opens its wings at rest like most dragonflies (p. 108). Perhaps God deliberately designed these exceptions just to thwart evolutionary explanations.

This book includes descriptions of numerous highly complex behaviors that demand intelligent design. This includes long migrations (pp. 76, 140, 160); males of some species changing color (p. 62); courtship: “... widely varied through damselfly families, sometimes being as elaborate as anything done by a bird” (p. 92); one species that exhibits parthenogenesis (asexual reproduction) (p. 72); unique reproductive

tactics, including “two points of contact during copulation, unusual behaviors such as sperm translocation (p. 95) and sperm displacement (p. 96), and even two quite different ways of depositing their eggs” (p. 89); males guarding females during egg laying (p. 101); and their life cycles, including aquatic larval stages (p. 108 f.).

A particularly amazing feature of the larvae of dragonflies is their rectum (pp. 128–129). It functions as part of the digestive tract, but also houses the respiratory gills, located in a complex structure called the branchial basket. Oxygen is taken in here, but wouldn't the feces foul this system? No, since they are enclosed in a membrane before they reach the rectum. How did that evolve by chance? What an example of irreducible complexity! But wait, there's more! The rectum also functions in locomotion. It can be rapidly contracted, expelling water out of the anus, resulting in jet propulsion for escaping predators.

The only scientific error I noticed was Paulson's statement that the “... separation of the copulatory organ from the genital opening is unique to Odonata” (p. 95). Perhaps he meant that it is unique among insects, since this is also true for spiders.

Reading this book can equip us to share amazing facts about these common creatures. When we behold them out in God's creation, it's a great opportunity to tell others about how amazing they are, an easy transition to sharing about our wonderful savior who made these beautifully decorated creatures.

Art Manning
rntc@juno.com

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 abbrevi-

ated 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.

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

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

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

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

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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.

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Submission of letters regarding topics relevant to the Society or creation science is encouraged. Submission of letters commenting upon articles published in the *Quarterly* will be published two issues after the article’s original publication date. Authors will be given an opportunity for a concurrent response. No further letters referring to a specific *Quarterly* article will be published.

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

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

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Creation Research Society

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

Activities—The Society is a research and publication society, and also engages in various meetings and promotional activities. There is no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund and research center are maintained to assist in such projects. Contributions to the research

fund for these purposes are tax deductible. As part of its vigorous research and field study programs, the Society operates the Van Andel Creation Research Center in Glendale, Arizona.

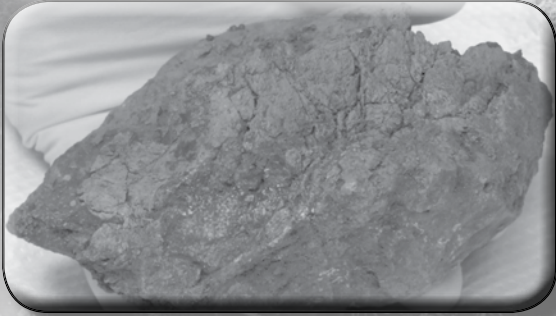
Membership—Voting membership is limited to scientists who have at least an earned graduate degree in a natural or applied science and subscribe to the Statement of Belief. Sustaining membership is available for those who do not meet the academic criterion for voting membership, but do subscribe to the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

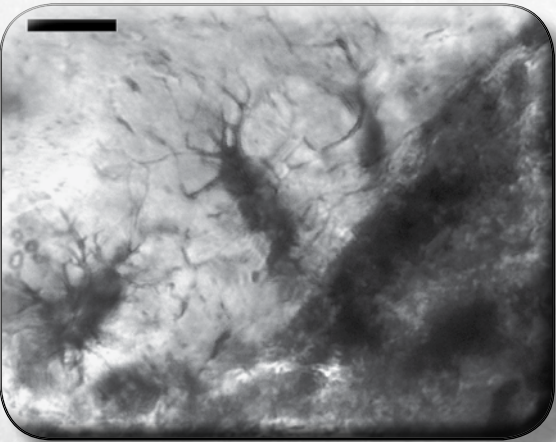
1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.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

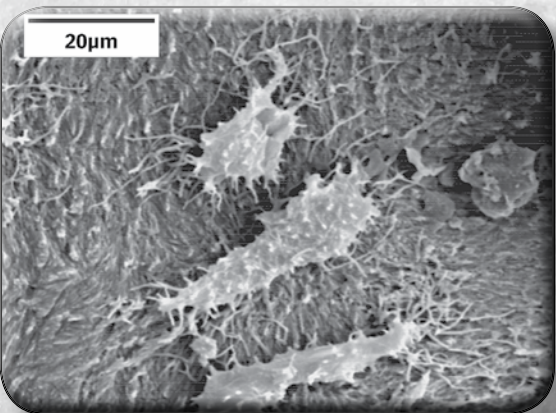
Investigation of Dinosaur Intact Natural Osteo-tissue



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.

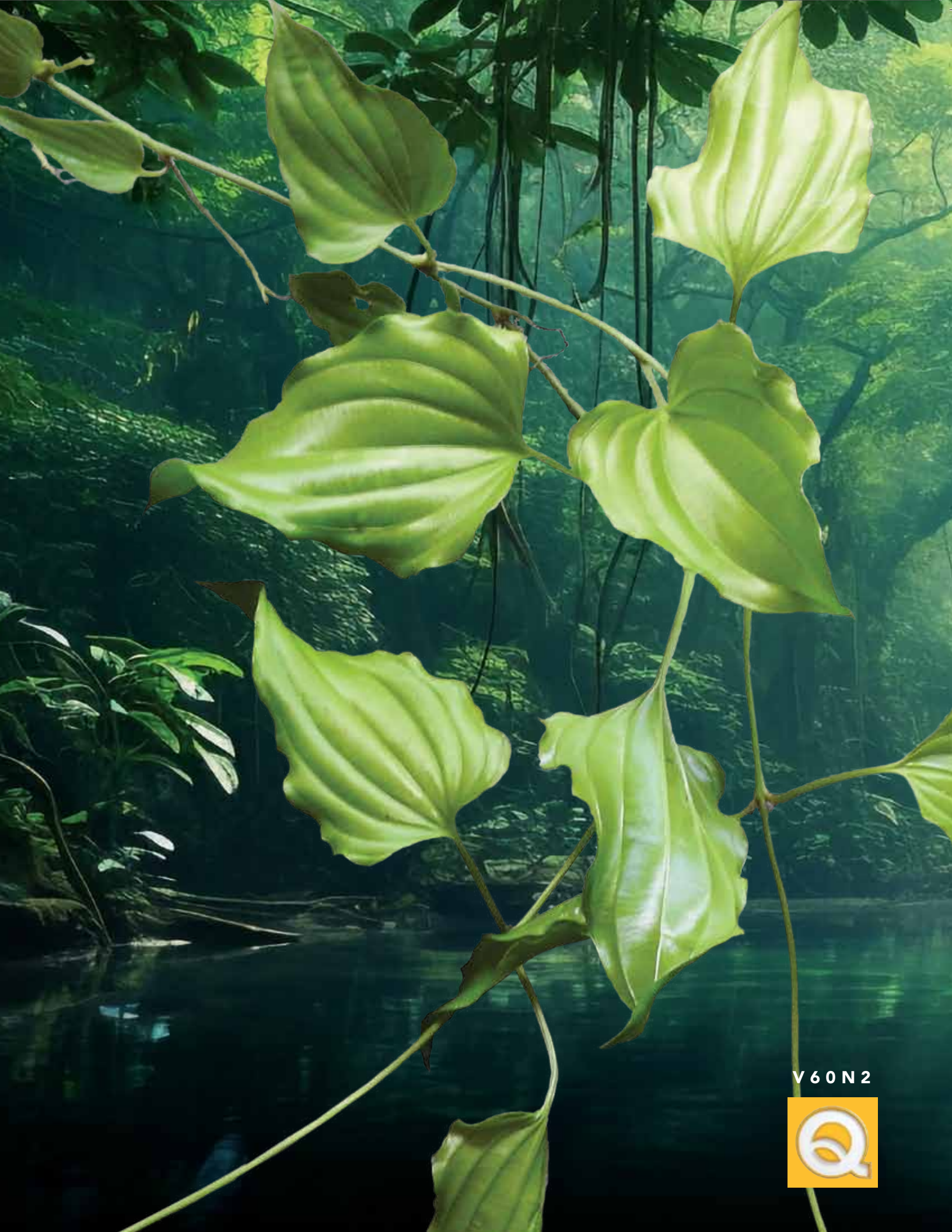
The Creation Research Society began its iDINO research initiative for the purpose of studying soft tissue in dinosaur fossils. The first phase of the project detected pliable, unfossilized tissue in a brow horn of a *Triceratops*. Within this tissue were intact osteocytes (bone cells). Some results from 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.



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