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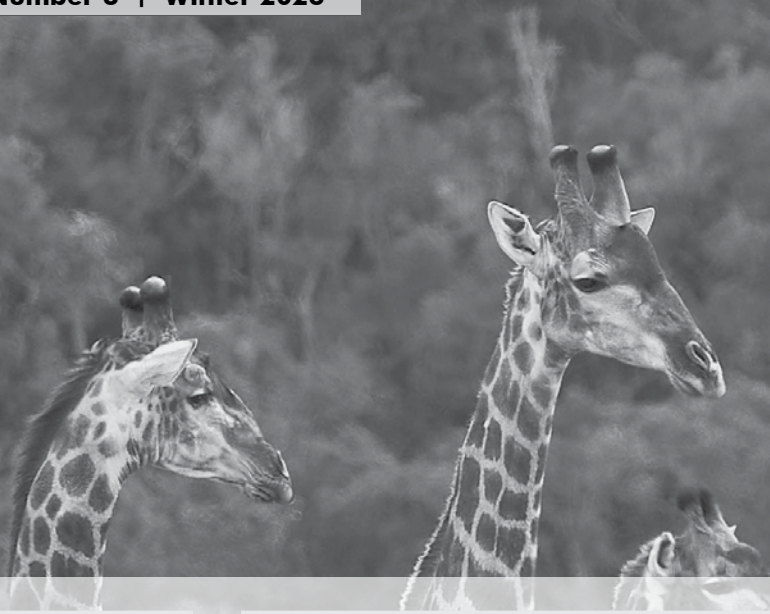

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Haec Credimus

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

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A Diluvial Interpretation of the Appalachian Provinces: Geology and Geomorphology

Michael J. Oard,
John K. Reed,
and Peter Klevberg

Abstract

The physiographic provinces and general geology of the Appalachians and associated provinces are described. The Coastal Plain Province starts at the Fall Line and forms an increasingly thick wedge of sediment that continues offshore to thick margin sediments. It was deposited by paleocurrents flowing eastward. The Piedmont Province is an erosion surface with monadnocks and metamorphosed, except for sediments in the numerous rift valleys. It is thought to have formed from accreted exotic terranes from the east. West of the Piedmont are the Blue Ridge Mountains, the elevated, metamorphosed core of the Appalachians. The Valley and Ridge and the Appalachian Plateau Provinces are described with sediments of the Appalachian Basin that thicken southeast over 13,600 m. Overlying the eastern Piedmont is the Coastal Plain sediment wedge, extending offshore. Some are exposed; others lie under Coastal Plain sediments. The region is extremely complex. Uniformitarian theories center on orogenesis and plate tectonic cycles over hundreds of millions of years. Though intensively studied, problems and puzzles exist. We note several and offer a Biblical explanation for some major features. During the Flooding Stage, the Blue Ridge and Piedmont were thrust northwest as one massive unit. At the same time, large cratonic basins and rifts were developing to the west. The Retreating Stage saw great erosion of the Appalachians and Piedmont. Waning east-directed currents deposited the Coastal Plain sediment wedge and formed water and wind gaps late in the Genesis Flood.

Key Words: Appalachians, Blue Ridge Province, Central Atlantic Magmatic Province, coal rank, Deep River Basin, erosion, exotic terranes, Piedmont Province, rift basins, thrusts, Valley and Ridge Province

Accepted for publication July 19, 2025

Simple Summary

The Appalachian Mountains, which run 2,400 km along eastern North America, are divided into five main geographic areas, including the Coastal Plain, Piedmont, Blue Ridge Mountains, Valley and Ridge, and Appalachian Plateau. Conventional geologists explain this region's complexity through uniformitarian processes like continental and island arc collisions and plate tectonic cycles over hundreds of millions of years. However, this paper offers a Diluvial Interpretation based on the Biblical Genesis Flood. During the Flooding Stage, the Blue Ridge and Piedmont Provinces were thrust northwest as a massive unit, while deep basins formed to the west, accumulating sedimentary rock that may have reached up to 20,000 meters thick in the Appalachian Basin. The later Retreating Stage of the Flood caused immense erosion of the Appalachians and the Piedmont, forming widespread planation surfaces and depositing the thick Coastal Plain sediment wedge towards the east. This massive erosion, potentially removing several kilometers of rock (up to 6.5 km in some areas, based on coal rank), suggests the Appalachians were once significantly higher.

Introduction

The Appalachian Mountains of eastern North America run 2,400 km from central Alabama to Newfoundland (Figure 1). The region is broadly composed of five physiographic (geomorphological) provinces, defined by similar geomorphic features (Fenneman, 1938; Thornbury, 1965; Oard, 2011a) (Figure 2). These are: (1) the Coastal Plain, (2) the Piedmont, (3) the Blue Ridge Mountains, (4) the Valley and Ridge, and (5) the Appalachian Plateau provinces. The focus of this article is to describe the general geology and geomorphology of the Appalachians to provide a regional context for the Deep River Basin, a rift basin in central North Carolina, which will be published later.

The Blue Ridge and Valley and Ridge provinces are the core of thrusting and deformation, and together range from 160 to 500 km wide. The highest mountains today are the Great Smoky Mountains in the Blue Ridge of western North Carolina and eastern Tennessee. Mount Mitchell, 2,037 m asl, near Asheville, North Carolina, is the highest point east of the Mississippi River. Grandfather Mountain, about 64 km north of Mount Mitchell, tops out at 1,810 m asl (Figure 3). They were, at one time, presumably much higher.

Explaining the Appalachians has proven difficult, despite nearly two hundred years of uniformitarian research by secular geologists. Spotila and Prince (2022, p. 1) state: "Despite vast scientific inquiry, the evolution of Appalachian Mountain topography in eastern North America has yet to be robustly explained."

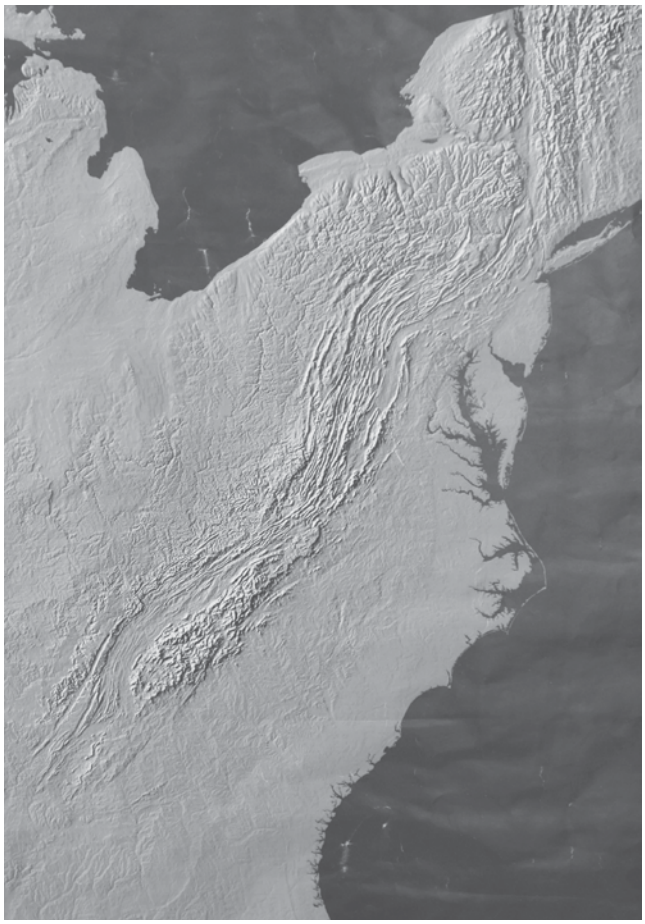

Figure 1. The distinctive geomorphology within the United States of the Appalachian Mountains, the Blue Ridge, and Valley and Ridge Provinces, as seen from space (from Landforms of the Conterminous United States).

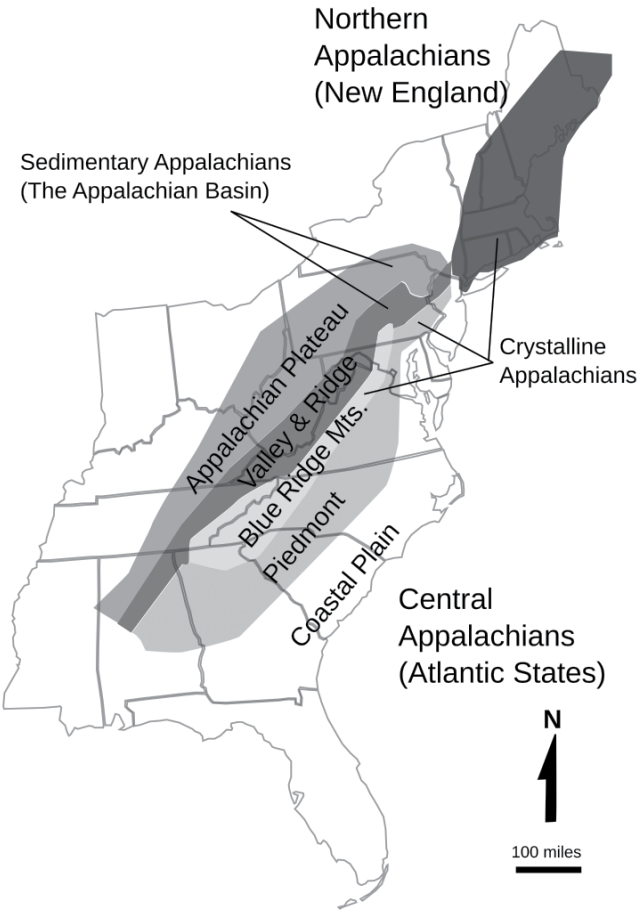

Figure 2. Map of the Appalachian provinces and the two provinces to the west (Jo, USGS, public domain).

Figure 3. Grandfather Mountain in the southern Blue Ridge Mountains at 1,810 m asl as seen from the Blue Ridge Parkway at 1,265 m asl.

Appalachian Provinces

The Coastal Plain

The Coastal Plain Province is defined by both geomorphic and stratigraphic expression. On the Atlantic coast, it is a wedge of sedimentary rocks, thickening from the Fall Line, and dramatically so offshore. The "Fall Line" is a slight topographic drop. It was defined long ago by the upstream limit of shipping, because a slight escarpment created waterfalls and rapids in the coastal rivers. This is attributed to riverbeds dropping abruptly as they transitioned from hard Piedmont igneous and metamorphic rocks to the softer sediments of the Coastal Plain.

Coastal Plain sediments blanket a significant erosional surface. Eastward-flowing, late-Flood currents probably accomplished both the erosion and deposition, the two processes reflecting changes in flow energy. The true volume of this sediment is seen in its offshore thickening onto the continental shelf, slope, and rise (Figure 4). In the northern coastal plain, from New Jersey to Maryland, onshore sediments reach over 2,200 m, then over 9,000 m in offshore basins. In the central coastal plain, North Carolina and Virginia, they reach over 3,000 m onshore, before thickening to about 18,000 m in the Baltimore Canyon trough. In the southern coastal plain, onshore sediment thickness is below 1,500 m, but reaches more than 9,000 m in the Hatteras Basin (Straume et al., 2019).

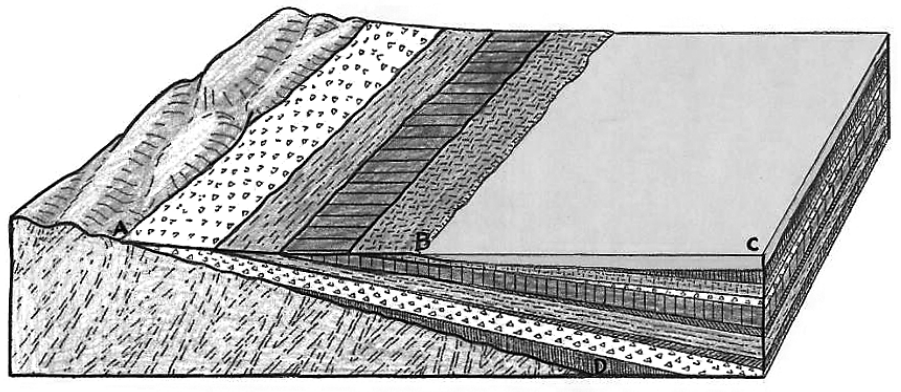

Figure 4. Schematic of coastal plain and offshore sediment wedge (drawn by Melanie Richard).

The Piedmont Province

The Piedmont Province extends northeastward from Alabama to the Hudson River (Figure 2), ranging up to 200 km wide. The Piedmont's elevation gradually rises westward from the Fall Line to the Blue Ridge Mountains. The Piedmont is composed of igneous and metamorphic crust that extends beneath the Coastal Plain to the continent margin. Its lithologic and structural complexity is great, and is currently explained by the accretion of exotic terranes onto eastern North America (Hatcher et al., 2007). The North Carolina interactive map of 2017 shows a number of these terranes (Figure 5).

Martin and Bosbyshell (2019, p. 1064) note: "Many names and shifting criteria have been used to categorize the metasedimentary rocks of the Piedmont Province in the central Appalachian Orogen over the past 130 years…" Previously, terranes were defined by geomorphology, but today, detrital zircon ages are more often used (Martin and Bosbyshell, 2019), which, in some cases, contradict the geomorphology. The designation of an exotic terrane can be difficult in the Piedmont, due to variable lithology and intense

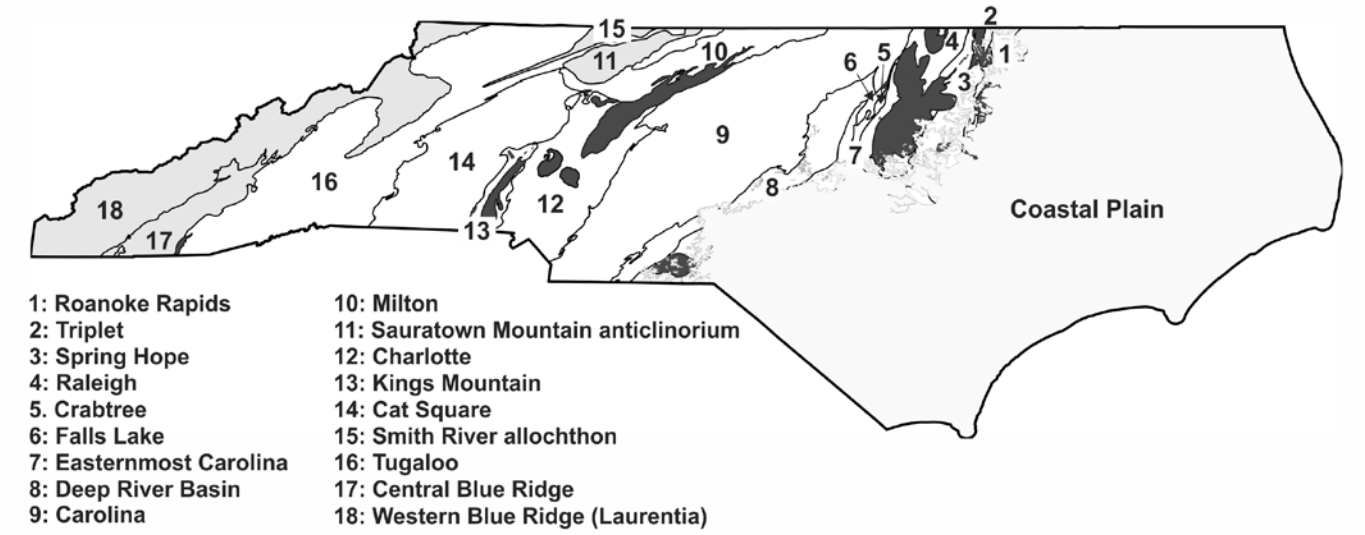

Figure 5. Terranes of the Blue Ridge and Piedmont of North Carolina. Medium gray areas are Blue Ridge terranes. Black areas are plutonic intrusions. The Deep River Basin lies at the eastern edge of the Carolina terrane. Note the increasing complexity near the Coastal Plain. From https://experience.arcgis.com/experience/8eaba8247a8c4347b47a38120a3f0570/.

metamorphism. The "Trenton Prong" in southeast Pennsylvania and west-central New Jersey was once considered an exotic terrane but is no longer (Volkert and Aleinikoff, 2021). Masis et al. (2024, p. 1) state the difficulty in interpreting terranes for New England:

> In contrast, the boundaries between the accreted terranes themselves… are more difficult to distinguish in New England due to their similar geologic characteristics, burial by post-accretion sediments, poor exposure, lack of a clear geophysical signature, and overprinting by post-accretion deformation…

The province has been *planed fairly flat* across its entire area (Figure 6), but exhibits numerous erosional remnants called monadnocks (Figure 7). Stone Mountain, Georgia, is probably the best known (Froede, 1995), rising 240 m above the surrounding terrain (Figure 8). The presence of rolling hills and monadnocks technically makes the Piedmont an erosion, rather than a planation surface (Neuendorf et al., 2005), but many kilometers of rock were eroded off the current surface.

The Piedmont has a large variety of rocks that have been heavily metamorphosed; metamorphic grade increases westward to the Blue Ridge (Marzen et al., 2019). It even contains some claimed mantle rocks (Miller et al., 2006).

Many rift valleys have formed that roughly parallel the northeast-southwest trend of the Blue Ridge Mountains, from Florida to near the Georges Bank (Figure 9). Some are exposed (e.g., the Newark Basin); others are buried beneath Coastal Plain sediments (Heffner, 2013: Post et al., 2015). In Florida, Georgia, and South Carolina, they are all buried under Coastal Plain sediments, although the Dunbarton Basin, near Augusta, Georgia, is very near the Fall Line (Marine and Siple, 1974). These basins are filled with predominantly unmetamorphosed terrestrial sediments and some basalt and diabase sills and dikes.

Figure 6. Lake on the Piedmont near Parkersville, South Carolina, showing the general flatness of the terrain.

Figure 7. Granitic monadnock on the Inner Piedmont, east of the Blue Ridge Mountains, close to Caesars Head State Park, South Carolina.

Figure 8. Stone Mountain, Georgia, monadnock (photo courtesy of Carl Froede).

The Newark Basin reaches depths of over 9,000 m, but most are shallower. The Deep River Basin, which we have especially studied, is thought to have obtained a depth of a little more than 2,500 m (Reid et al., 2010). Diabase sills were injected after the basins formed and prior to erosion.

The Blue Ridge Province

The Blue Ridge Province is the crystalline core of the Appalachians and exhibits the highest elevations. It includes a variety of severely deformed igneous and metamorphic rocks believed to have been thrust northwest (Hatcher, 1972; 1978). The amount of thrusting is difficult to estimate. Hatcher (1972) believed the maximum distance was 125 km. Bartholomew and Hatcher (2010) now think it is 150 to 300 km based on "paleostress indicators." Levine et al. (2025) claim 300 km.

On the southeast edge of the Blue Ridge Mountains, in the southern Appalachians, is an escarpment about 500 km long with a sharp change in elevation between 300 and 600 m. It is most abrupt in western North Carolina, where it rises nearly vertically for about 600 m (Figure 10). Spotila et al. (2004, p. 42) stated:

> In northern North Carolina and southern Virginia, the Blue Ridge highlands exhibit low relief, such that the escarpment is a striking boundary between two subdued surfaces, which we refer to as the Upland and Piedmont surfaces.

Along the eastern boundary of the Blue Ridge Province lies the Brevard Zone, a major 700 km-long, 1–3 km wide fault zone, dipping southeast, extending from Alabama into Virginia (Hatcher et al., 2007). It contains highly sheared and crushed rocks, including mylonite. The Brevard Zone has undergone intense study, with various interpretations that include a continental suture zone, strike-slip fault, and thrust fault (Hatcher, 1978). Parker et al. (2015) map the Brevard Zone as an overthrust contact. Levine et al. (2025) consider the Brevard Zone a strike-slip fault separating the Blue Ridge from the Piedmont Province.

The Valley and Ridge Province

The Valley and Ridge Province, west of the Blue Ridge, extends from Alabama to New York, and is composed of numerous parallel valleys and ridges (Figure 1), formed during late thin-skinned thrusting, involving primarily sediments. Many of the valleys are eroded anticlines (Gore and Witherspoon, 2013) of softer rocks, with resistant rocks forming the ridges.

Its distinct appearance comes from it being a fold and thrust belt, verging northwest (the direction of thrusting). Thrusting is shown by "windows" eroded through the thrusts (Harris and Bayer, 1979).

Along the eastern edge of the province is the "Great Valley." It extends the full length of the Appalachians, from Alabama to the St. Lawrence Lowland of Canada, though low passes create segments. It varies from 3.5 km wide just north of Roanoke, Virginia, to 80 km at its southern end. It has many local names, such as Coosa, Shenandoah, Cumberland, Lebanon, Hudson, and Champlain. The sedimentary rocks underlying the Great Valley are deformed and folded like the rest of the Valley and Ridge, yet have been planed into long, narrow erosion surfaces (Perry, 1978). Many cities and towns were built in the Great Valley, and Interstate 81 runs almost its entire length.

Appalachian Plateau Province

The Appalachian Plateau Province is west of the Valley and Ridge. It includes the Allegheny Plateau in the north and the Cumberland in the south. The limestone layers of the Cumberland Plateau have one of the largest concentrations of caves in the world (Taylor, 2020). Farther west is the Interior Low Plateaus Province, which is not considered part of the Appalachians. Thick sedimentary rocks of the Appalachian Basin underlie the Appalachian Plateau and Valley and Ridge Provinces, thickening eastward.

Appalachian Basin sediments are deformed in the Valley and Ridge, but less so in the Appalachian Plateau Province. They thicken southeastward (Figure 11) and reach a depth of 7 to 10 km beneath West Virginia (Lebold and Wilkinson, 2018), and thicken to 12–13 km in Pennsylvania (Milici and de Witt, 1988; Way, 1999). The maximum thickness is over 13.7 km in the eastern

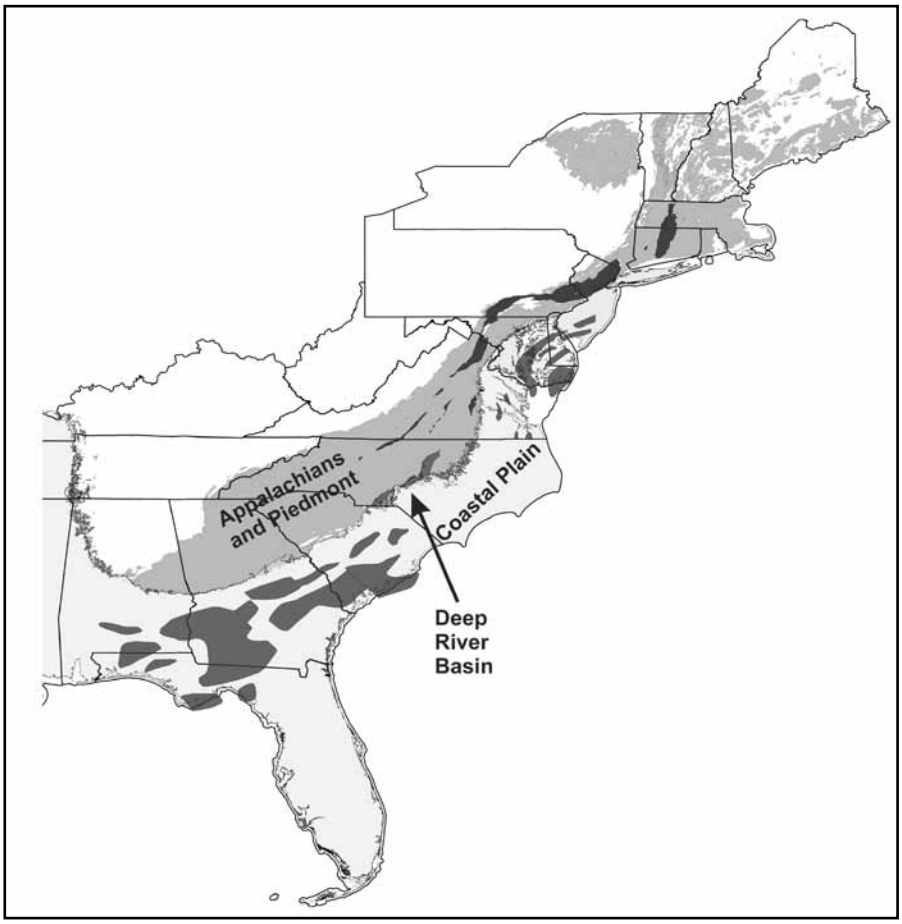

Figure 9. Rift basins occur within the Piedmont and Blue Ridge provinces (black); some are exposed and some are below Coastal Plain sediments (light gray). Basin locations and shapes from Heffner (2013), Post et al. (2015), and various state surveys.

Figure 10. Blue Ridge Escarpment, a 600 m cliff, at Caesars Head State Park, South Carolina (view southeast).

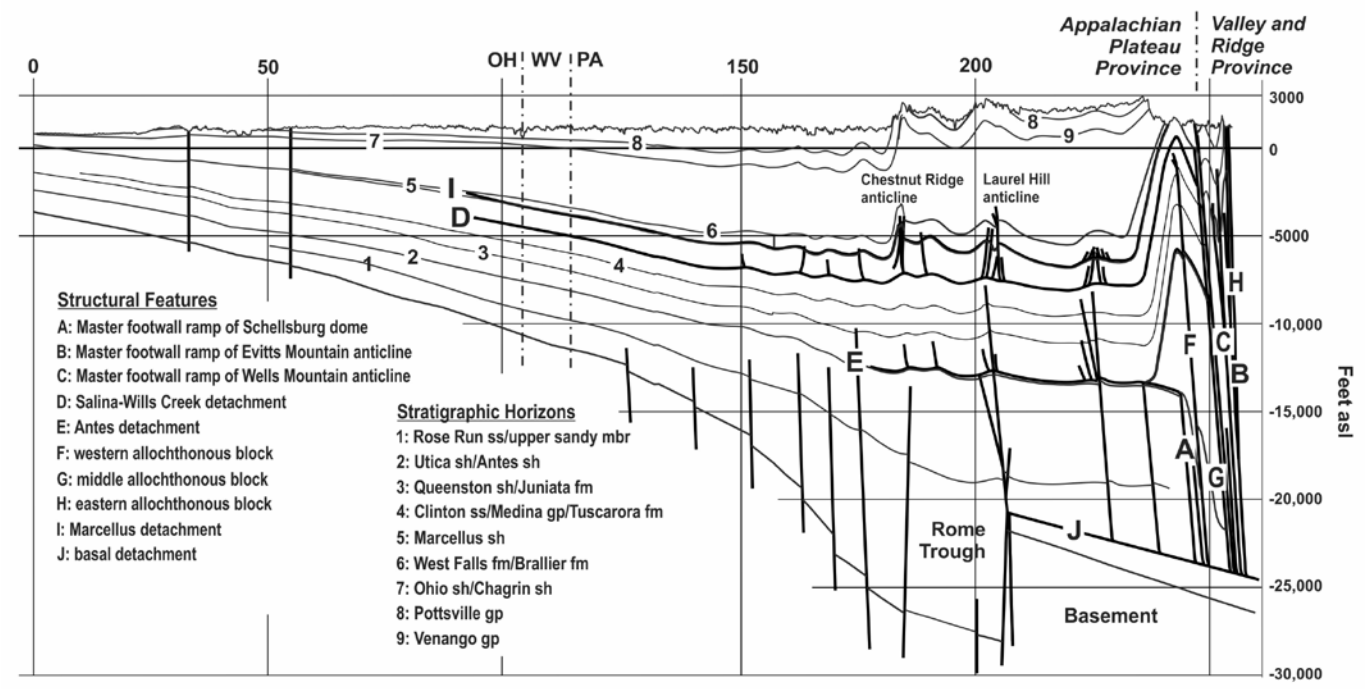

Figure 11. Schematic of USGS Cross-Section C-C′ (Ryder et al., 2012), showing the structural deformation of Appalachian thrusting over the eastern Appalachian Basin. Key stratigraphic horizons are shown to illustrate the thickening into the basin and subsequent deformation in the Valley and Ridge.

part of the Appalachian Basin (Martins et al., 2022).

The Cumberland Mountains are a narrow band of low hills between the Cumberland Plateau and Valley and Ridge in the Central Appalachians (Figure 12). The Allegheny Mountains are a continuation of the Cumberland Mountains into Pennsylvania along the eastern edge of the Allegheny Plateau. In both plateaus, elevation is relatively low in the west, but increases sharply on the eastern, deformed edges.

Uniformitarian Theories

Conventional scientists think the Appalachians were formed by continental collisions between North America and Europe/Africa from the Neoproterozoic to the late Paleozoic (Hatcher, 1989; Plummer and McGeary, 1996; Hatcher et al., 2007). They claim the assembly of Rodinia in the Mesoproterozoic (1.3–0.9 Ga) formed the Grenville Mountains, supposedly among the largest in history (Krabbendam et al., 2017). They are believed to have eroded over millions of years, with transcontinental rivers spreading sediments into western North America (Blum and Pecha, 2014; Mulder et al., 2017; Rainbird et al., 2017; Oard, 2019). Conventional geologists claim Rodinia broke apart in the Neoproterozoic (0.75–0.55 Ga), and in the Late Paleozoic, Pangea formed. Throughout the Paleozoic, thick sedimentary rocks accumulated in the Appalachian Basin foreland.

Furthermore, secular scientists believe the East Coast experienced smaller collisions that welded exotic terranes onto North America and caused the classical Appalachian orogenies: the Taconic (Ordovician-Silurian), the Acadian (Devonian), and the Neoacadian (Devonian-Mississippian), followed by the Alleghenian (Pennsylvanian-Permian) (Marzen et al., 2019). These exotic terranes have had a variety of names. In the Southeast, these include the Charleston/Brunswick and Suwannee Terranes (Marzen et al., 2019). North Carolina's geological survey divided the Piedmont and Appalachians into many smaller terranes (Figure 5). In the northern Appalachians, the terranes have different names (Mohaver and Darbyshire, 2022). Gore and Witherspoon (2013, p. 181) say: "Recognizing terranes and their boundaries is not easy because these tectonic collisions happened over a very long period of time, during which many types of rocks were forming." Levine et al. (2025) claim that the Neoacadian and Alleghenian collisions were one orogeny.

Thus, "Many questions remain about the style of orogenesis in ancient

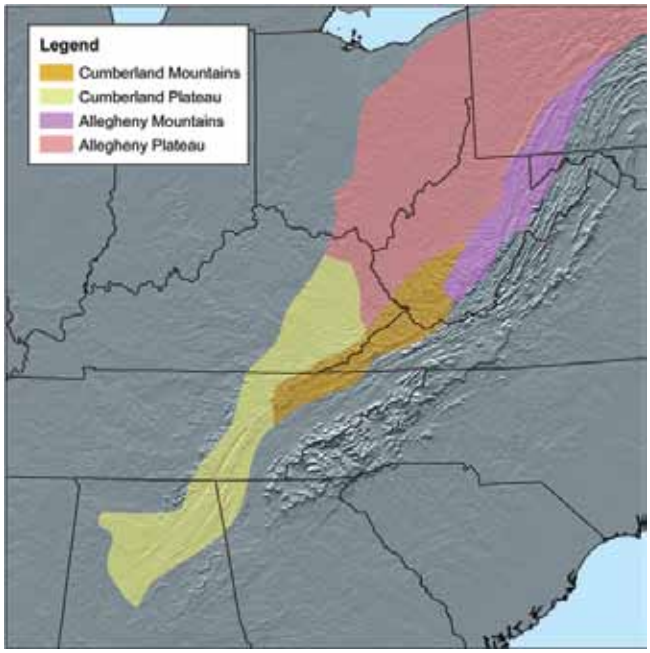

Figure 12. Map showing the Cumberland Plateau and Mountains and the Allegheny Plateau and Mountains (Kmusser, Wikimedia Commons CC-BY-SA-2.5).

Figure 13. Location of large residual elements of the Central Atlantic Magmatic Province (Williamborg, Wikimedia Commons CC-BY-SA-3.0).

orogens and the effects of orogenic structures on later tectonic events" (Marzen et al., 2019, p. 6625). After these orogenies, the Piedmont is believed to have moved southwest by strike-slip motion along the Brevard Zone (Gore and Witherspoon, 2013).

Therefore, uniformitarian scientists believe orogenesis was ongoing from the late Proterozoic through the Paleozoic. During that time, the core of the Appalachians is believed to have formed by repeated northwest thrusting up to several hundred kms (Perry, 1978; Simmons, 1983; Hatcher, 1989, 2010; Levine et al., 2025). Some involved crystalline basement, but some did not, hence the terms 'thick-skinned' and 'thin-skinned' tectonics, respectively. This thrusting is associated with intrusions of mostly granitic rocks (Misra and Keller, 1978; Miller et al., 2006) throughout the Appalachians. During these collisions, the Appalachians were believed to have pushed up as high as the modern Himalayas (Karle, 2009). The mechanism and energy source for this overthrusting and mountain building are not known, but conventional scientists assume it is because of exotic terrane or continental collisions.

During the Mesozoic (200–100 Ma), Pangea split. Early rifting saw basalt flows across the Piedmont and the Coastal Plain (McHone, nd), part of the Central Atlantic Magmatic Province (CAMP), believed to have covered 11 million km^2 in North America, South America, Africa, and Europe. Like other Large Igneous Provinces (LIPs), a large volume was quickly emplaced in less than one million years (Marzen et al., 2019). This basalt has been almost completely eroded (Figure 13) and is absent on the continental shelf (Marzoli et al., 2011). Basalt has been preserved in some rift basins, generally conformably layered with sedimentary rocks (Schlische and Ackermann, 1995; Withjack et al., 2009; Marzoli et al., 2011). Basin sediments are Triassic to Jurassic, and the basalts are Jurassic.

The CAMP basalts extend along the entire continental margin and are believed to be up to 20–25 km thick (Holbrook and Kelemen, 1993), and are likely the cause of the Brunswick and East Coast magnetic anomalies (Oh et al., 1995).

The CAMP basalts are considered independent of the younger Cenozoic basalts (Storey et al., 2007) of the North Atlantic Magmatic Province. This younger basalt is believed to have formed a large plateau that was later broken up during spreading. Remnants are found in eastern Greenland, Northern Ireland, western Scotland,

northwest Iceland, the Faroe Islands, and many other islands of the northeast North Atlantic Ocean. Although the North Atlantic Magmatic Province is considered distinct from the CAMP basalts, they are all thought to be the result of rifting.

The origin of the volcanism is unknown (Marzen et al., 2019) but, generally, attributed to continental separation. This is also the time when the Piedmont rift basins formed (Lang et al., 2024). The basalt is believed to have originated in the upper mantle from the uplift of the hot asthenosphere and decompression melting (Lang et al., 2024).

The Appalachians present many challenges. One often not considered is the paucity of outcrops because of such well-vegetated areas. Another is that paleocurrent directions indicate westward flow in the Appalachian Basin, for the most part (Whitaker, 1955; Nichelsen, 1958; Pelletier, 1958; Yeakel, 1962; Schlee, 1963; Pettijohn, 1970). This indicates an eastern source, possibly the Blue Ridge Mountains or the Piedmont. Following the Paleozoic, there was apparently a paleocurrent reversal that indicates flow toward the southeast, accompanied by significant erosion. The reason for this reversal remains controversial (Kaktins and Delano, 1999).

Methods: Placing the Appalachians in Biblical Earth History

It is a challenge to reorient all of the intense study of the Appalachians into a Biblical perspective. To begin, we refer to Walker's (1994) model (Figure 14). Like any flood, the water rose to a peak during the Flooding Stage, then receded during the Retreating Stage to the current sea level. Unlike small floods, Noah's Flood included profound geological events. We suggest five phases for the Appalachian region.

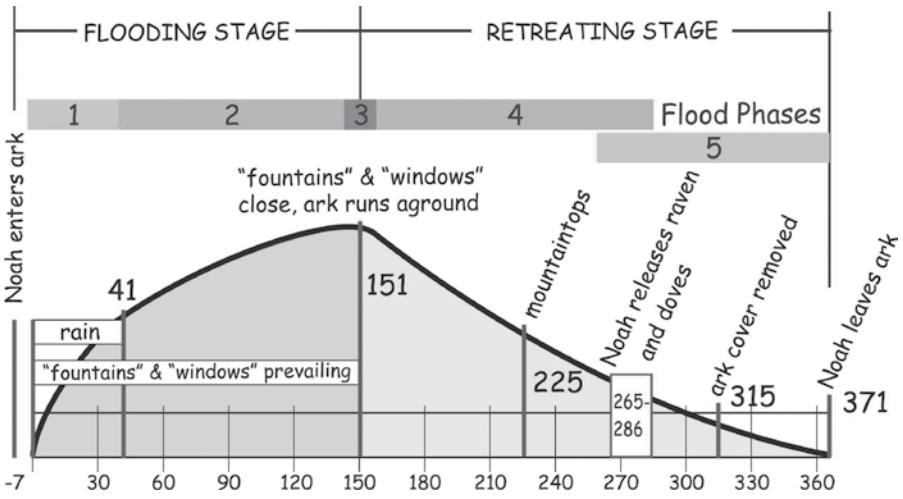

Figure 14. The stages and phases of Noah's Flood and key Biblical events from Walker (1994); drawn by John Reed.

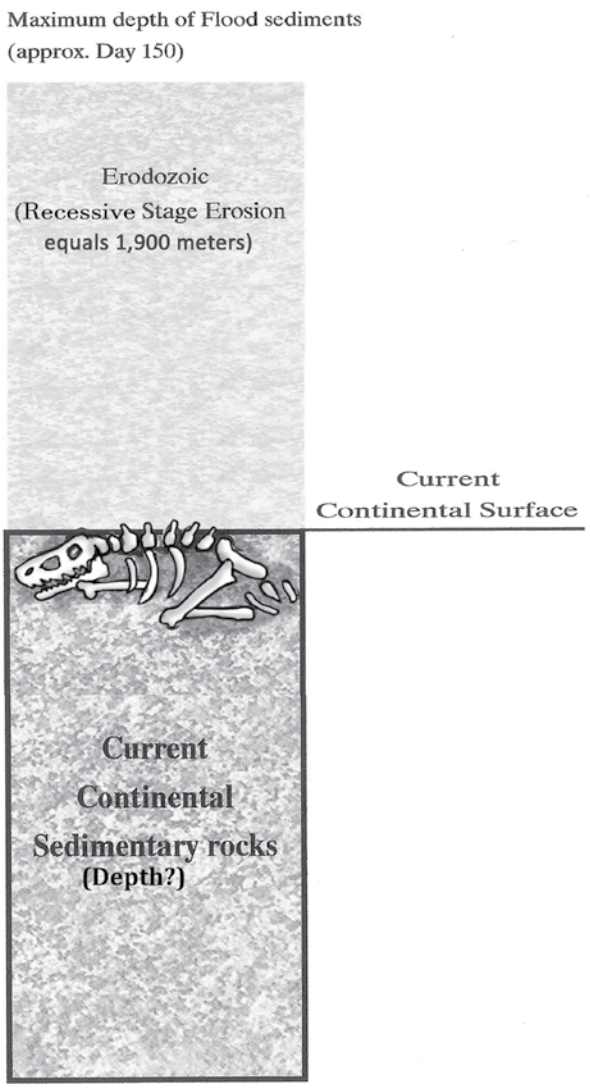

Figure 15 *(right)*. Block diagram showing the maximum amount of sediment on the continents at the peak of the Flood, with 1,900 eroded during the Recessional Stage and an unknown depth of sedimentary rock remaining on the continents. For the mid-continent region, the remaining sediment thickness is approximately 1,800 m (drawn by Melanie Richard).

To help tie the stages and phases of Figure 14 to empirical geology, we initiated the Flood Sediments Research Project (FSRP) (Reed et al. 2022, 2024, 2025; Oard et al., 2023a,b).

The initial purpose of the FSRP is to determine the volume and distribution of all diluvial sediment. Based on the volume of upper Mesozoic and Cenozoic continental margin sediment, we determined that an average of around 1,900 m was eroded from all the continents during the Retreating Stage of the Flood, creating much of the sediments of the Atlantic margin and the Gulf of America (formerly, Gulf of Mexico) (Reed et al. 2022; Oard et al. 2023a). This implies that the volume of diluvial sediment in the central and eastern U.S. was once much greater. The present average thickness in the midcontinent region is about 1,800 m (Reed et al., 2024). If we add back 1,900 m, then an average of 3,700 m of sediment was present there at the peak of the Flood (Figure 15).

As verification of the Retreating Stage erosion, the coal indicates tremendous erosion of the Appalachians. Coal is common in the Valley and Ridge and Appalachian Plateaus provinces. There are 62 mineable coal beds in West Virginia alone (Lebold and Wilkinson, 2018). Coal rank generally increases to the southeast up to high-rank anthracite (Hower and Rimmer, 1991). Assuming rank was a result of heat and pressure from burial, the coal rank implies many kilometers of eroded sedimentary rock, especially where coal is found near the surface. The inferred thickness of eroded overburden varies with other factors, such as geothermal gradient. But if the temperature of the eroded sediment was warmer than expected, the amount of overburden would be less.

Erosion off the Catskill Mountains of New York, by this method, was estimated at about 6 km (Friedman and Sanders, 1982), assuming a normal geothermal gradient and no local heat sources. A higher gradient or past thermal process would reduce the estimate (Hower and Rimmer, 1991). Lower rank bituminous coal has many subdivisions, ranging from sub-bituminous C (1.7 km of removed overburden) to low volatile bituminous A (a little more than 6 km) (Thomas, 2013).

This method is equally valid in the Valley and Ridge. Assuming no other heat sources and a normal geothermal gradient, 4.0–6.5 km of rock was eroded from the Valley and Ridge. Coal in the Deep River Basin indicates up to 6 km of erosion from the Piedmont.

This simple method, if valid, implies that the Appalachians were once higher than today's Rocky Mountains! Detritus from their erosion was transported east, west, and south, depending on the topography and flow direction at the time. Some is thought to have made it as far west as the Colorado Plateau (Froede, 2004; Oard, 2009) based on uranium-lead ratios in zircon crystals.

A diluvial sediment isopach map of the midcontinent region also shows the large-scale rifting at the onset of the Flood (Figure 16) (Reed et al., 2025). At the same time, major parts of the basement were being heavily eroded, as shown by pinnacles in the Kansas basement (Cole, 1976), which we interpret as erosional remnants (Figure 17). Both of these events occurred prior to deposition of the Sauk Megasequence.

Determining the Genesis Flood sediment volume and distribution requires mapping the base of diluvial sediments, as we did for the midcontinent region. However, some uncertainties arise where the base of diluvial sedimentation is unclear, as in the Midcontinent Rift, and must be assumed (Figure 16). Nonetheless, the upper surface was either a DEM or the base of Ice Age sediments. When done elsewhere, volume can be calculated for any geographical area. This constrains hypotheses about sediment source, transport, and deposition, allowing more realistic estimates about diluvial geology. So far, we have surmised that sediments along the Gulf and Atlantic margins came from the North American craton during Phases 4 and 5 (Figure 14), and that much diluvial sediment on the craton largely originated from the cratonic basement, especially the Canadian Shield, helping to create the Great Unconformity. These eroded diluvial sediments (not including the rifts) were later deposited on the Great Unconformity (Sengör et al., 2022).

An example of rock volume eroded from the Canadian Shield is at the claimed Sudbury impact site. Erosion there has been estimated at about 5 km (Senft and Stewart, 2009), and the rest of the southern Canadian Shield is believed to have eroded anywhere from 2–11 km, based on igneous and metamorphic pressure estimates of surface rocks (Figure 18) (Sengör et al., 2022). The highest value mirrors Senft and Stewart's (2009) erosion estimate from the Vredefort Impact Structure on the Kaapvaal Craton of southeast Africa. So, it is difficult to determine the antediluvian topography of North America, although it is likely that erosional estimates based on metamorphic grade are exaggerated and could have been affected by early diluvial catastrophism. Regardless, it is safe to say that significant amounts of rock were removed from the Canadian Shield at some point in the Flood Year, but especially early in the Flood.

Moreover, significant volumes of rock were eroded across the United States, as seen in the extent of the Great Unconformity on the craton (Figure 19). The eroded sediment was transported to other areas of North America. Significant subsequent deformation is demonstrated by the fact that while the Great Unconformity is near the base of the Grand Canyon in northern

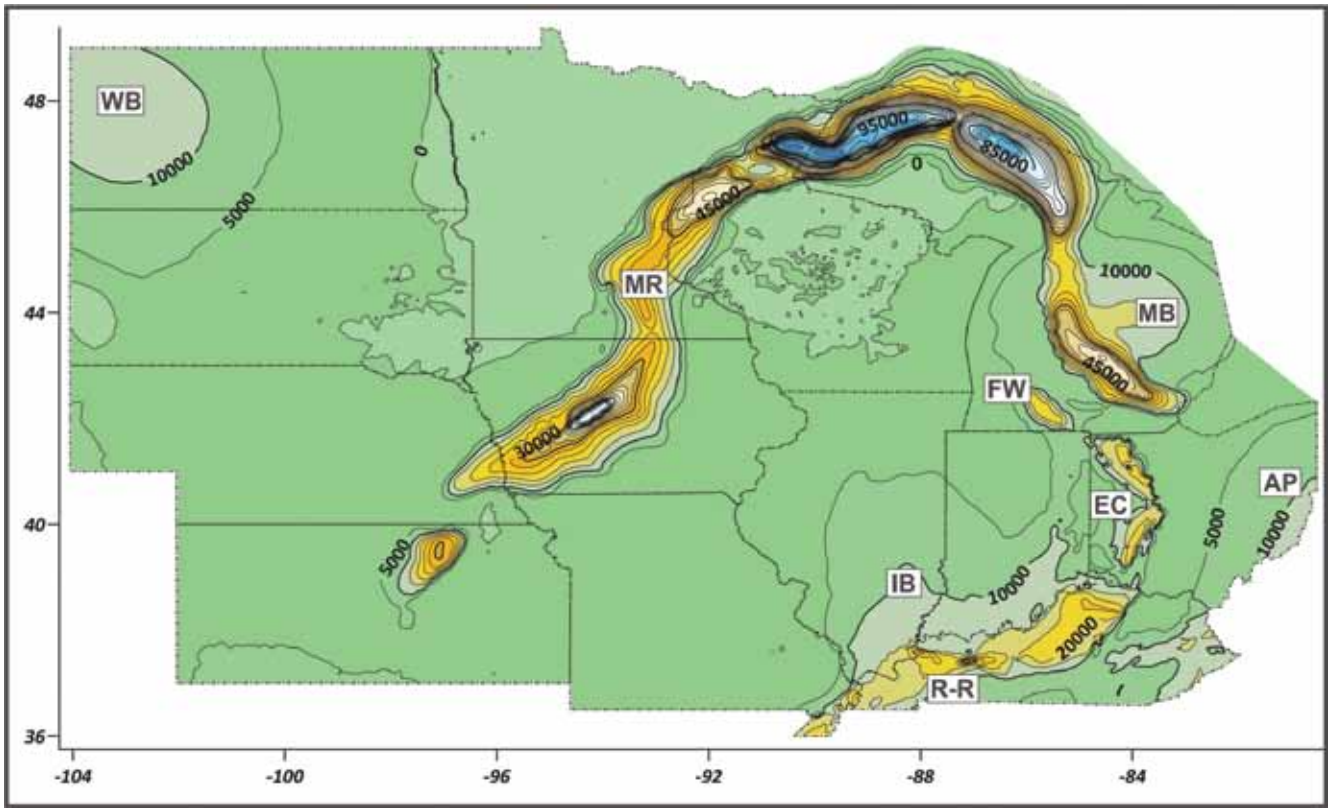

Figure 16. Isopach map from the ground surface to the diluvial basement in the north-central United States in feet. The contour interval is 5,000 ft. MR is the Midcontinent Rift, WB is the Williston Basin, IB is the Illinois Basin, MB is the Michigan Basin, AP is the Appalachian Basin, EC is the East Continent Basin, and RR is the Reelfoot/Rough Creek/ Rome Rifts.

Arizona, it is found atop mountains in southern Montana and Wyoming.

Discussion: Earth History of the Appalachians— *The Flooding Stage*

The Flooding Stage begins with Phase 1 on Figure 14. Numerous sudden catastrophes were occurring simultaneously, including volcanism, meteorite impacts, vertical tectonics, tsunamis, and global heavy rain for 40 days, etc. Their significance is seen in the rifts of Figure 16 and a few of the large Precambrian impacts (Oard and Reed, 2017; Oard and Carter, 2021; Reed et al., 2025). Sedimentation occurred in deep rifts and basins. Many of these are

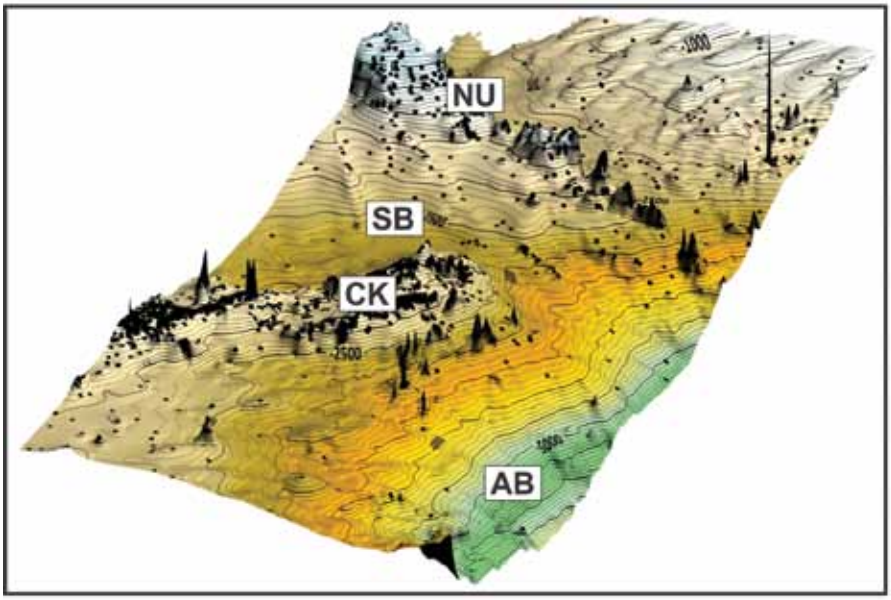

Figure 17. Erosional remnants on the Kansas basement surface, as mapped by Cole (1976), and with significant vertical exaggeration, looking east from Colorado. The erosional remnants are controlled by multiple wells (black dots).

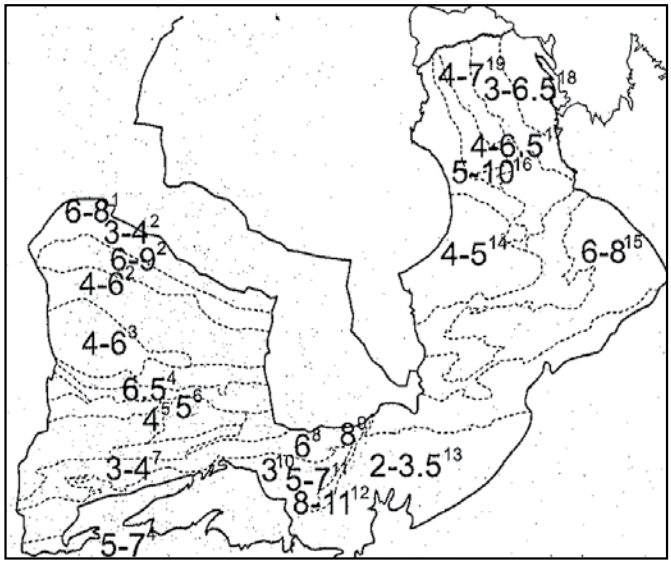

Figure 18. The amount of erosion of the Superior Province, southern Canadian Shield, based on igneous and metamorphic pressure estimates on the surface (from Sengör et al., 2022, Figure 8).

Figure 19. The North American craton (USGS public domain).

designated as Precambrian sedimentary rocks and volcanic rocks (Oard et al., 2023b).

Continental-scale marine transgression eventually covered the land by the maximum of the Flood, believed to be about Day 150 (Boyd and Snelling, 2014). Whitcomb and Morris (1961) called this second phase the "prevailing" of the Flood. As currents and turbulence slowed, the "Great Deposition" would occur, in which massive sediment was laid down, often with minimal deformation. The sequence in Grand Canyon and the

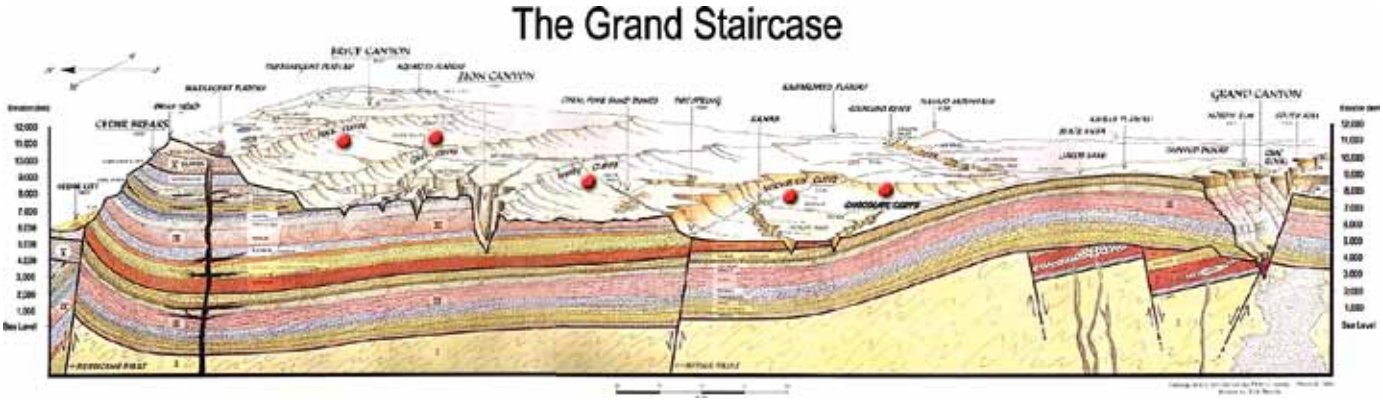

Figure 20. The Grand Staircase and the Grand Canyon. Red dots from left to right: Pink Cliffs, Grey Cliffs, White Cliffs, Vermilion Cliffs, Chocolate Cliffs (National Park Service, public domain).

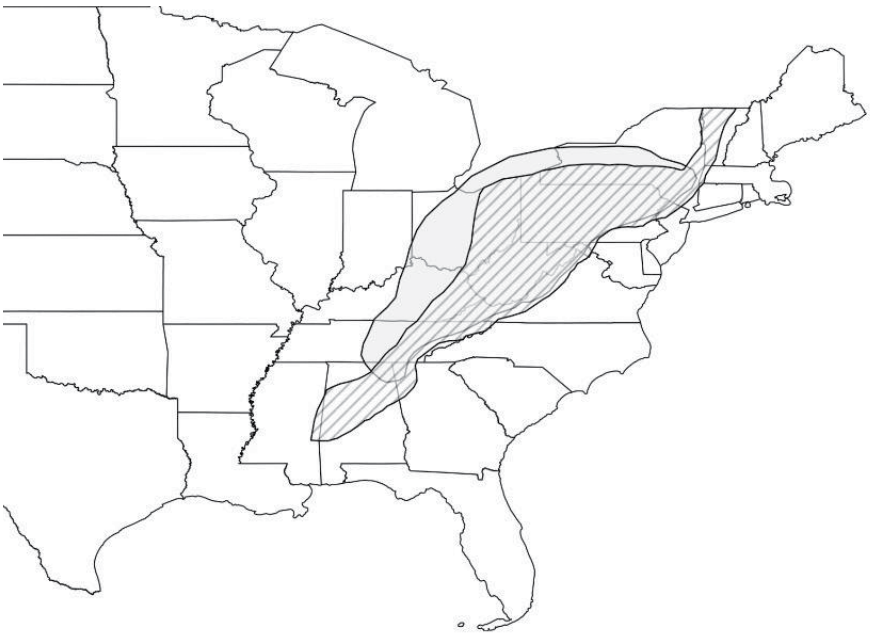

Figure 21. The Appalachian Basin. The solid gray is from Evenick (2021), and the cross-hatched is from Coleman and Cahan (2012).

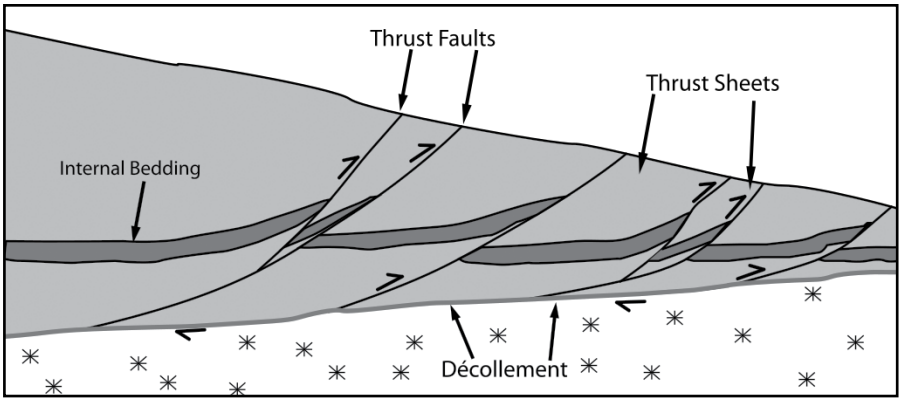

Figure 22. Schematic of multiple imbricate thrusts above a décollement (Tberli3, Wikimedia Commons CC-BY-SA-3.0).

Grand Staircase to the north (Figure 20) is a case in point: 3,000–5,000 m of sediment was laid down with little faulting and folding, even later. Of course, on a global scale, local conditions would determine the amount of deformation, the Appalachians and Piedmont being examples of intense deformation and metamorphism. Significant thrusting was occurring there during the deposition of the sediments in the Appalachian Basin.

During Phase 2, 13,700 m of sediment, plus the sediment eroded during the Retreating Stage, accumulated on the west side of the Appalachians (Figure 21). The eroded sediment could have reached 6,000 m based on coal rank and the volume of sediments on the continental margins (Oard, 2011a). If so, the basin contained up to 20,000 m at the peak of the Noahic Flood.

It is uncertain how much sediment accumulated east of the Appalachian orogen. At present, there is very little known. There are metasediments and metavolcanics in the Piedmont, but their stratigraphic position in the Deluge is unclear. We could label them antediluvial (pre-Flood), except for the sparse presence of Ediacaran fossils in the Carolina Terrane of North Carolina (Weaver et al., 2008; Hibbard et al., 2009). So, it is unclear if they are the earliest Flood or pre-Flood.

Westward-directed paleocurrents in the Appalachian Basin are also perplexing. It is possible the source was Europe and Africa prior to separation late in Phase 2 (see below), which is contrary to the belief of conventional geologists, who do not believe continents existed to the east during most of the Paleozoic. Another possible source is the ancestral Appalachians, since there are few claimed Paleozoic sediments east of the Appalachians. Furthermore, U/Pb dates in zircons in sediments of the American Southwest indicate they originated in the Appalachians (Goddard et al., 2025). Mainstream scientists believe that the Blue Ridge and Piedmont Provinces rose from mid-crustal depths, based on their present metamorphic grade. These could be exaggerated since metamorphism also depends on temperature. For example, if the area was hotter, the rock need not have risen as much. Indications of regional higher heat are provided by the numerous granitic plutons in the provinces, and even some exposed mantle rocks (Misra and Keller, 1978; Miller et al., 2006). The Blue Ridge and Piedmont Provinces certainly moved upward, but maybe not from mid-crustal depths.

The Blue Ridge and Piedmont

As noted earlier, the Blue Ridge and Piedmont were overthrust to the northwest. Erosion during uplift could have exposed the metamorphic rocks, which may be altered Creation Week crust. This transport is believed to be well over 100 km and to have occurred on a décollement at depth, but it is difficult to detect (see below). The contact of the Blue Ridge Province with the Valley and Ridge Province does not show much overthrusting (see Figure 11).

A Biblical model must reexamine the conventional terranes and orogenies. A major difference between Biblical and secular natural history is the fiat creation of the antediluvian crust, rather than its evolution over several billion years and multiple Wilson cycles. We suspect that much of the deformed igneous and metamorphic basement of the Piedmont and Appalachians was Creation Week crust.

Northwest thrusting of the Piedmont, as postulated, requires a deep master detachment surface, or décollement (Figure 22). However, this feature is elusive on seismic data: "One of the most elusive tectonic features in the southern Appalachians is the AD [Appalachians décollement]" (Frothingham et al., 2022, p. 1,306). Although it is difficult to image a décollement on seismic charts, it is possible that it does not exist. This would suggest a more vertical component, with less net horizontal movement.

Also, the various terranes, if accreted, are too homogeneous. The terranes are said to be island arcs and continental slivers. But geophysical velocity transects for the crust in the southern Appalachians show little variation, as if such convergence never happened:

> The crustal velocity structure required to fit the data is surprisingly simple considering that this crust experienced multiple terrane events during the Appalachian orogeny, CAMP magmatism, and extension during the breakup of Pangea" (Marzen et al., 2019, p. 6,637).

Figure 23. Aerial view of multiple overthrusts (ridges) along the Rocky Mountain Front (Bobak Ha'Eri, Wikimedia Commons CC-BY-3.0), looking north across the Sun River Canyon. The lake is the Gibson Reservoir, west of Augusta, Montana, USA, and is formed by a dam on the Sun River. The Lewis Overthrust is just out of the figure to the left, west of the wide north-south valley of the Middle Fork of the Sun River.

However, conventional geologists claim that there is at least one Moho offset in the northern Appalachians (Hillenbrand et al., 2021). Below the Moho, tomographic images of the eastern United States do not indicate any terrane boundaries. However, there is a mysterious high-velocity anomaly west of the Appalachian Basin that extends vertically down to 800 km and then slants eastward with depth below 800 km (Schmandt and Lin, 2014). It is unknown what is the meaning of this high-velocity region is, but Schmandt and Lin (2014) believe it is a remnant of the Farallon Plate subducted from the west, but this is contrary to previous beliefs, in which the remnant Farallon Plate is much deeper. The near-vertical high velocity mantle is certainly not related to any proposed terrane or continental collisions from the east.

Thrusting in the Valley and Ridge Province

The thrusting of the Blue Ridge and Piedmont compressed the eastern side of the Appalachian Basin in the Valley and Ridge (Figure 11). Evidence suggests that these thrusts could have formed by gravity spreading. Uplift of the Blue Ridge and Piedmont Province would have provided abundant potential energy for the Valley and Ridge thrusting. Uplift adjacent to the eastern Appalachian Basin could have caused sheets to slide downward and northwest, causing the fold and

Figure 24. A three-toed dinosaur track from the Culpeper Basin, Virginia (Smokeybjb, Wikimedia Commons CC-BY-SA-3.0).

thrust belt. As shown in Figure 11, thrusting attenuated quickly into the Appalachian Basin, resulting in the relatively undeformed Appalachian Plateau Province, but causing uplift of the Cumberland and Allegheny Mountains on their eastern margin.

Fold and thrust belts from gravity spreading are seen elsewhere. The imbricate overthrusts along the eastern edge of the Rocky Mountain front in central Montana (Figure 23) (Mudge, 1972; Oard and Klevberg, 2015) provide a possible analog. Secular geologists have mapped at least nine major stacked thrusts, and dozens of minor ones, in the region just east of the continental divide. These overthrusts likely were caused by the potential energy of uplift of the Rocky Mountains.

Piedmont Rifts Late in the Inundatory Stage

We can estimate the timing of the Piedmont Rifts in the Flood Year (Figure 9). The sedimentary rocks of these rifts are *not* metamorphosed and must have been deposited after the main erosion of the Blue Ridge and Piedmont Provinces. Dinosaur tracks found in these sediments (Figure 24) likely place the rifts in Phase 2 of Figure 14.

Earth History of the Appalachians—*The Recessional Stage*

The Recessional Stage was marked by the formation of new ocean basins and the regression of Floodwater off the continents and into them. It was marked by erosion (Oard, 2013). As discussed above, the exposed coal rank indicates that possibly up to 6.5 km of rock was removed from the region. This fits Phase 4 (Figure 14) of the Retreating Stage. The erosion produced geomorphological features that cannot be explained by conventional geologists.

Erosion and Planation Surfaces

The initiation of late-Flood regression likely saw wide currents eroding the Appalachians, the Piedmont, and the Appalachian Basin. A widespread erosion surface formed on the Piedmont by eastward-flowing currents (Oard, 2011b). Another large planation surface formed on the Appalachian Plateau by westward-flowing currents.

Lithologic variations suggest that uniformitarian erosion would have created a more rugged surface, with hard rocks eroded less than soft rocks. In other words, harder rocks should be mountains and softer rocks, deep valleys. But in the Appalachians, both hard and soft rocks were planed by the same erosion event. Fenneman (1938, p. 122) stated:

> At a much later time, the older belt became two physiographic provinces by the reduction of its seaward side of a relatively late peneplain [planation surface] (Piedmont Province), while the higher belt on its western side (Blue Ridge Province) was not destroyed.

Thick Continental Margin Sediments Accumulated as a Sheet

Sediment from this erosion formed the clastic wedge along the continental margin. Material from the western Appalachians and Appalachian Basin was transported to the Gulf Coastal Plain. Rifts occurred off the East Coast when the Atlantic seafloor sank relative to North America. Poag and Sevon (1989, p. 119) stated: "The primary forcing mechanisms considered have been tectonic and isostatic uplift and subsidence…" Tectonic uplift of the eastern United States is believed to have caused the erosion, while the total amount of subsidence along the continental margin is believed to have been 14 km (Poag and Sevon, 1989; Poag, 1992)!

Lang et al. (2024) reinforce this vertical component, with a deepening margin during continental uplift. Thick sediments accumulated offshore. In the Baltimore Canyon Trough, which extends some 400 km from Cape Hatteras to Long Island (Pickering et al., 1989), there is a maximum fill thickness of 18 km (Pazzaglia and Gardner, 2000). Its total area is 200,000 km^2. Similar troughs and rifts occur offshore (Straume et al., 2019). These are likely independent of the Piedmont rifts. The sediment along the continental margin was deposited as a continuous sheet during Phase 4, as shown by seismic profiles parallel to the coast (Lang et al., 2024). These thick and extensive sedimentary wedges are best explained by massive sheet flow off the continents.

Phase 5 Channelized Flow Eroded Linear Features

As the base level dropped, the runoff was likely forced around emerging obstacles and channelized during Phase 5 (Figure 14), forming spectacular water and wind gaps in the Blue Ridge and

Valley and Ridge Provinces (Oard, 2012; Lee, 2013). The Great Valley could have been eroded by southwest/northeast currents caused by the emergence of the Blue Ridge Mountains. On the Appalachian Plateau, the planation surface was dissected by these channelized currents. Offshore, submarine canyons, like the Hudson Canyon, possibly formed during accelerated channelized runoff (Oard, 2013). The end result of the greatly diminished channelized erosion at the end of the erosion phase was the modern drainage system.

Conclusion

Conventional geologists have attempted to explain the Appalachians within their paradigm. However, the region is incredibly complex, and there are still many unresolved issues. They believe multiple orogenies were caused by repeated collisions during the Rodinia-Pangea cycles. This resulted in the accretion of what are called 'exotic terranes' of the Piedmont. Several geological and geomorphological features seem contrary to this interpretation. For example, thrusting in the Appalachians was well inland from these collisions. Why was the force transmitted that distance, instead of causing deformation at the continental boundary? As seen in the Appalachian Basin, deformation can also end abruptly. It is possible that the Appalachians formed by Cordilleran-like uplift and thrusting, with gravity spreading causing the Valley and Ridge Province.

Whatever the explanation, the region experienced severe deformation and metamorphism. Tectonic activity likely caused the numerous Piedmont rift basins that filled with sediment and the CAMP volcanics.

The Flooding Stage transitioned into the Retreating Stage, and the Appalachians underwent massive erosion, forming erosion, planation surfaces, and water and wind gaps. This tentative model seems to explain the broad features of the Appalachians. In Part II, we will focus on one of the rift basins, the Deep River Basin, for a more detailed analysis within Biblical Earth history.

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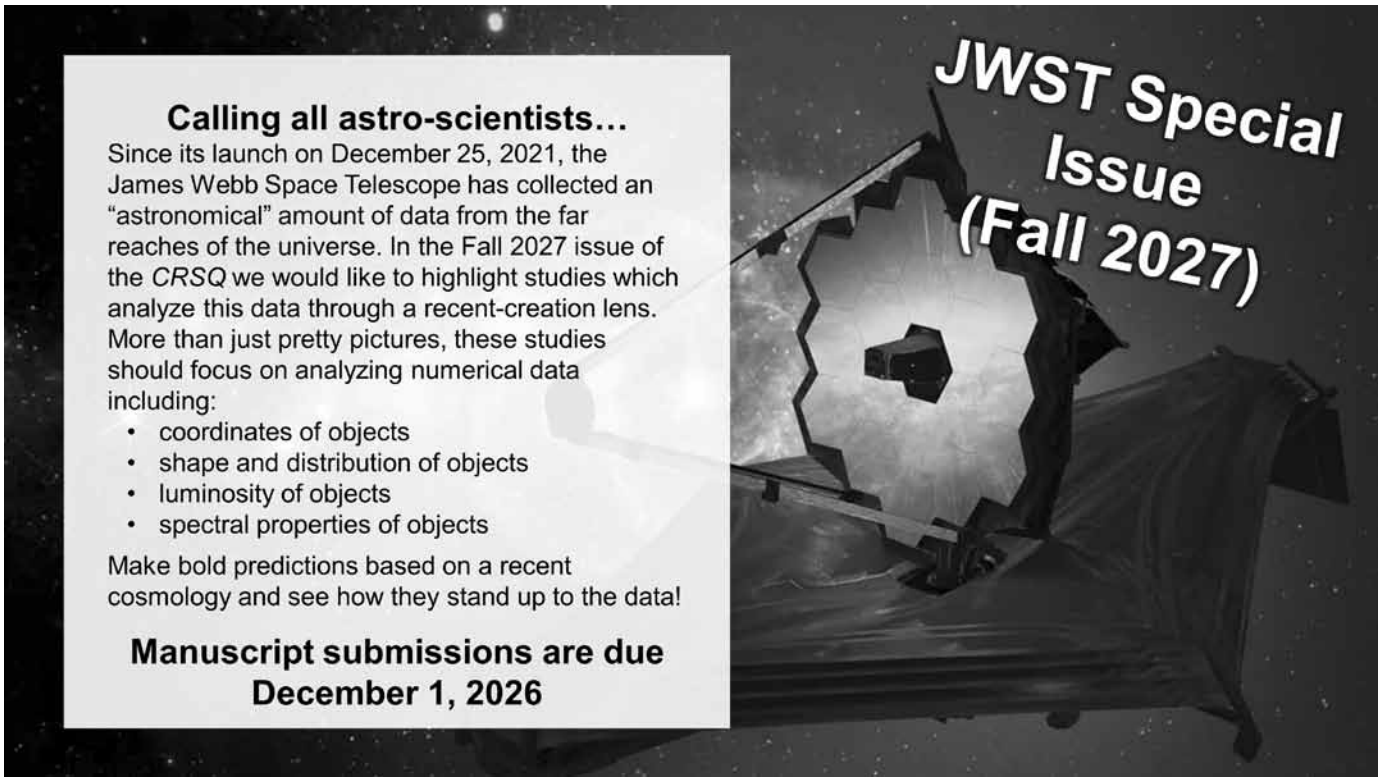

Central Configurations and Creation

Marvin Grimm

Key Words: central configurations, cosmology, dark matter, rotation curves

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Abstract

Dark matter was originally introduced to explain galaxy rotation curves. Later, it was also invoked to explain the behavior of galactic clusters and to explain and model gravitational lensing. It is part and parcel of the currently accepted mainstream cosmological model of the evolution of cosmic structure in general, the "Lambda Cold Dark Matter" (ΛCDM) model. Creationists have been encouraged to accept dark matter because it offers evidence of design and stability in the universe, two characteristics that are expected from a Creator Who pronounced His cosmos as good, and even very good. In this paper, we present central configurations that offer a mathematically rigorous explanation of rotation curves without recourse to dark matter. We also look at a refutation of this explanation, an analysis of the refutation, and a possible application to creation cosmology.

Simple Summary

Dark matter is widely used in mainstream cosmology, specifically the ΛCDM model, to explain why the measured circular speeds (rotation curves) of spiral galaxies remain flat or rise at their outer edges instead of declining as expected. Creationists have sometimes accepted dark matter because it suggests design and stability in the cosmos. However, this article presents an alternative explanation using "central configurations," which are mathematically rigorous solutions to the Newtonian N-body problem that describe how groups of discrete bodies can maintain their shape while rotating. Donald Saari claimed that the standard formula (Equation 1) used by astronomers to estimate a galaxy's mass from its rotation speed is inappropriate for systems of discrete stars (N-body systems), leading to overestimated mass predictions, especially at the outer edges. This idea was challenged by Kadowaki, who argued that the failure of Equation (1) is due to its assumption of spherical symmetry, which galaxies lack, rather than the mass distribution being discrete. Kadowaki concluded that standard methods already account for non-spherical shapes and that the impact of discreteness is negligible, making skepticism about dark matter unwarranted. Despite this refutation, the sources suggest that Saari was justified in using Equation (1) because it often serves as a "standard approach" in galactic dynamics, particularly when considering objects at the outer edges of galaxies. The study of central configurations provides a framework that creationists can explore as a possible basis for astronomy and cosmology that focuses on design and stability without requiring dark matter.

Introduction

One of the lines of evidence for the existence of dark matter in the universe involves the rotation curves, or circular speed curves, of spiral galaxies. The acceleration of an object in circular motion with speed v_c and distance r from the center is the centripetal acceleration $a=v_c^2/r$. If the only force on the object is gravitational, this will be the gravitational acceleration, which is due to the distribution of mass near the object, usually expressed in terms of a mass density distribution. This distribution will define a gravitational potential whose gradient is the gravitational force. Hence, there arise various potential-density pairs that describe the mass distribution (density) in galaxies and potentials generated by them. Binney and Tremaine (1987) devote an entire chapter to Potential Theory in which they present the potentials for a number of continuous mass configura-

tions. In particular, for a spherically symmetric density distribution, $\rho(r)$, they derive the expression for circular speed at distance r from the center

$$v_c^2 = \frac{GM(r)}{r}$$

where $M(r)$ is the enclosed mass at distance r from the center and G is the universal gravitational constant. This can be rewritten as

$$M(r) = \frac{rv_c^2(r)}{G} \quad (1)$$

The circular speed then provides a way to measure the mass interior to r for spherical systems.

In deriving Equation (1), Binney and Tremaine (1987) made use of Newton's first and second theorems (not to be confused with Newton's *laws*):

- Newton's First Theorem: A body inside a spherical shell of mass experiences no net gravitational force from the shell
- Newton's Second Theorem: A body outside a spherical shell of mass behaves as though the shell's mass is concentrated at the center

Binney and Tremaine (1987) also consider the potential (and in some cases the circular speed and/or the density distribution) for: a point mass (circular speed decreases with increasing radius as $r^{-1/2}$: Keplerian); a homogeneous sphere (circular speed increases linearly with radius: a rigid body); a power-law density profile (mimicking the luminosity profiles in many galaxies); a number of flattened systems (disks); ellipsoidal systems; axisymmetric systems; triaxial systems; axisymmetric disks; and non-axisymmetric disks. Linear combinations of these potentials are also available as models of mass density distributions of galaxies. In other words, astrophysicists have the tools to model a wide variety of mass distributions.

Of particular interest to the present discussion is the representation of disks as flattened spheroids. (Section 2.6.1 of Binney and Tremaine, 1987) Here they say: "disks differ from spherical distributions of mass, for which the force at r_0 depends only on the density at $r < r_0$. In fact, the surface density of a disk at $R > r_0$ affects the attraction at r_0 because the annulus of material exterior to r_0 actually pulls a star placed at radius r_0 outward…At points in a disk where little matter is pulling outward, for example, on the perimeter of a sharp-edged disk, the circular speed can be much higher than at the edge of the spherical body with the same total mass and radius." (Binney and Tremaine, 1987, p. 72)

Spiral Galaxies

Since we are mainly concerned with spiral galaxies, a few words about them are in order. The observable components of a spiral galaxy include (Wikipedia, 2025):

- A central bulge of stars, which resembles an elliptical galaxy
- A flat, rotating disc of stars and interstellar matter (gas and dust), including the spiral arms
- A near-spherical stellar halo, including globular clusters

There is also a tenuous outer disc of gas, which Nelson (1988) calls the disc corona.

The central bulge, or spheroid, is referred to as a Population II system and is relatively small compared to the disk, at least for our Milky Way Galaxy. A Population II system contains stars with little or no net rotation, large random velocities, low heavy element abundances, and no young stars. The disk is made of what are known as Population I stars, along with gas and dust. The spiral arms are populated by bright O and B stars, gas, and dust. O and B stars are said to be young stars. Population I stars contain more heavy elements than Population II stars, since, according to theories of stellar evolution, they formed from the remnants of older stars. The disk, including the spiral arms, does exhibit rotation.

The surface brightness of spiral galaxies obeys an exponential law, and if the surface mass density is also modeled by an exponential law (see the section on mass-to-light ratio below), the rotation curve of spiral galaxies should be divisible into three regions:

- an inner region with circular speed rising linearly with distance from the center;
- a "turnover" region where the circular speed is maximum and then declines; and
- a region where the circular speed falls off in a Keplerian fashion as one over the square root of the distance: $r^{-1/2}$ (like planetary motion in the Solar System).

Most measured rotation curves display the first two regions, but the Keplerian region is not observed. Instead, most rotation curves are nearly flat or slowly rising with increasing distance from the core past the turnover region. As an example, the rotation curve for the galaxy M33 is shown in Figure 1. For M33, the speed increases linearly beyond the turnover region. The currently accepted explanation for these higher-than-expected circular speeds is that there is unobservable matter (dark matter) present, distributed in halos that extend past the optically observable portion of the galactic disk. The inferred *dark matter* halo should not be confused with the observed *stellar* halo mentioned above.

Dark Matter and Creation Science

Dark matter has been incorporated into the prevailing cosmology known as ΛCDM (Lambda Cold Dark Matter). Faulkner (2023) provides a history of dark matter and its relationship with

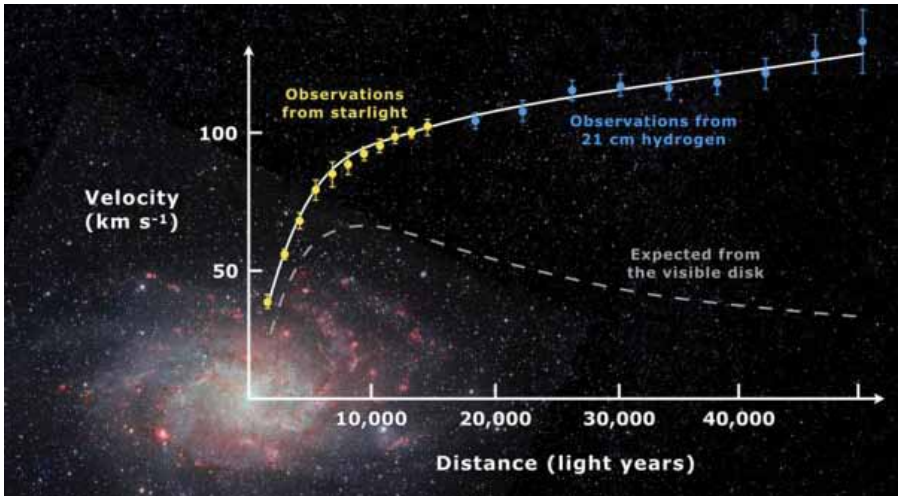

Figure 1. Measured rotation curve of spiral galaxy Messier 33 (points with error bars), and a predicted one from the distribution of the visible matter (gray line). The discrepancy between the two curves is usually accounted for by adding a dark matter halo surrounding the galaxy. Image credit: https://en.wikipedia.org/wiki/Galaxy_rotation_curve.

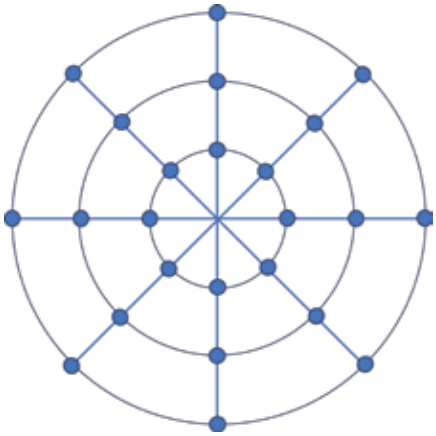

Figure 2. The "spider-web" central configuration with equal masses equally distributed in concentric circles about the center of mass. Note that neither geometric symmetry nor equal masses are required for central configurations. Configurations and velocities that form central configurations can be found for *any* choice of masses.

creation science. He cites the reluctance of most creation scientists to accept dark matter because of its use in ΛCDM. He asks how creationists handle rotation curves of spiral galaxies (without dark matter) and why the nuclear (inner) regions of these galaxies are subject to bound orbits but outer regions are not. He, rightly so, doesn't accept that "this is the way the world operates" is a satisfactory answer. Then he presents a dilemma for creationists who, again rightly so, insist on embracing design and stability in the cosmos: "Which is it? Did God create a stable world, or did He create an unstable world? Are creationists willing to sacrifice the stability argument in favor of a lesser argument for [a] relatively recent origin?"

A possible answer to this dilemma was introduced to the creation literature in Hartnett (2017), and we examine it here. This answer involves what are known as *central configurations*. Mathematician Donald Saari uses central configurations as an example of how rotation curves might be explained without dark matter. (See Saari, 2005; 2011; 2015; 2016) We will present Saari's explanation, a refutation of it, and an examination of this refutation along with lessons for and possible applications to creation cosmology.

The Importance (Necessity?) of N-Body Models: Saari

So far, we have addressed continuous mass distributions as approximations for the mass in a galaxy. Binney and Tremaine (1987, pp. 90–99) also discuss galactic dynamics as an *N*-body problem wherein the interactions between all bodies are considered explicitly. They point out the computational expense, i.e., having to evaluate N × (N-1) / 2 interactions for N objects (with N on the order of 10^9!), and numerical integration difficulties, i.e., as the distance between objects becomes small, the forces between the objects become large. (See J.S. Bagla and T. Padmanabhan (1997) for a review of cosmological N-body simulations.)

Saari (2015) essentially sidesteps the computational expense of N-body calculations by developing analytic solutions of the Newtonian N-body problem posed as "central configurations" and uses these solutions to analyze the use of Equation (1) to estimate galactic mass. (For more details on central configurations, see Appendix A as well as Battye et al., 2003; Saari, 2005; Gibbons and Ellis, 2014; Moeckel, 2014 and 2014a; Barbour, 2020). He claims that these particular configurations reflect the properties used to derive Equation (1), at least as closely as discrete systems can. Those properties are: highly symmetric mass distributions, circular orbits, and the total gravitational attraction on each mass is directed toward the center of mass.

In his analysis, Saari introduces so-called "spider-web" central configurations, as shown schematically in Figure 2, where masses are equally dis-

tributed in angle in concentric circles about the center of mass (Saari, 2015 and 2016). For the general spiderweb configuration, the masses on a given ring are the same, but not necessarily the same as the masses on other rings. (In the case in Figure 2, the masses would have to be nearly equal for it to be a central configuration.) In the following, we will consider N masses arranged in n concentric rings with $2k$ masses per ring. The masses are located at the intersection of the rings and spokes placed at equal angular spacing. In this case, $N = 2nk$. (We note in passing that another mass can be located at the center of mass for a total of $N+1$, or $2nk + 1$, masses.) For large values of k, the mass distribution is highly symmetric. Saari proves a theorem that states that for any positive integers k and n and any choice of mass $m_j > 0$ (for j=1 to n), unique spacings between the concentric circles exist that form a spiderweb central configuration, and any positive multiple of these spacings is also a spiderweb central configuration.

Let r_i refer to the radius of the i^{th} ring, as measured from the center of mass, and m_i refer to the mass of a single body on the i^{th} ring. Assuming circular motion, the position and acceleration vectors, $\boldsymbol{r}$ and $\boldsymbol{r}_i''$ respectively, for these spiderweb configurations satisfy

$$\boldsymbol{r}_i'' = \lambda_i \boldsymbol{r}_i \qquad (2)$$

A spiderweb configuration with the additional property that $\lambda_i = \lambda_j = \lambda$ for all i, j is called a "Saari configuration." In this case, Eq. (A.4) holds, repeated here as Equation (3).

$$\boldsymbol{r}_j'' = \lambda \boldsymbol{r}_j, j = 1, \ldots, N \qquad (3)$$

Saari configurations rotate with constant angular velocity (like a rigid body), so the rotational speed at r is proportional to r, and the constant of proportionality can be shown to be $\sqrt{\lambda}$. Then Equation (1) becomes

$$M(r) = \frac{\lambda r^3}{G} \qquad (4)$$

This means that the predicted mass distribution is always given by a cubic equation.

Saari works through an example of an n = 100 ring central configuration. He assumes the total mass on each ring adds up to one in order to simplify computations. He doesn't give the unique values for the ring spacings, but by the theorem cited above, we know they exist. Furthermore, by the same theorem, we know that any positive multiple of a central configuration is also a central configuration, so there is some multiple that will set the minimal spacing equal to 1, which he does. Given this, we know the mass enclosed by the j^{th} ring, located at r_j, is $M(r_j) = j$, and that the distance to r_j is at least j so $r_j \geq j$. This means that for arbitrary r, $M(r)$ is at best linear in r, i.e., $M(r) \leq r$, and *not* cubic like Equation (4). The cubic expression (Equation (4)) thus seriously overestimates the true $M(r)$ distribution, especially for the larger values of r, the outer edges.

Saari shows that problems arise whenever the predicted mass distribution significantly differs from the actual, including the predicted distribution you get from Equation (1) when a constant v_c (flat rotation curve) is encountered:

$$M(r) \approx Dr$$

In this case, too, the relative amount of mass at the edges is exaggerated. Hence, these predictions will also overestimate the actual mass.

Saari concludes: "According to the principles of scientific validation, unless new supporting arguments can be found, Equation (1) is not an appropriate way to predict $M(r)$ values for systems of N discrete bodies. Something in addition to, but probably different from, Equation (1) is needed…Thus, either the assumptions that are central in developing Equation (1) do not apply to discrete systems of N bodies, or the associated N-body solution can be expected to be a rotating rigid body causing exaggerated $M(r)$ predictions."

Saari (2015) states, "rigid body behavior can be expected to occur in portions of spiral galaxies as manifested by the nearly straight-line structure of the first part of the observed rotational velocity curves. With these observed values, the rotational structure conveys the flavor of a rigid body motion where separating particles on the galactic edges are being pulled along." What Saari calls the "first part" of the rotation curves is not the bulge which, according to the description of it above, does not rotate, but the part of the galaxy from the bulge to the beginning of the spiral arms. The "separating particles on the galactic edges" are the stars in the spiral arms and beyond. According to Saari, it is the "pulling along" of objects *on the galactic edge* that standard rotation curve analysis misses by assuming a continuous distribution of mass in a galaxy rather than treating the problem as a Newtonian N-body problem where individual interactions are tracked.

A Refutation of Saari's Conclusions: Kadowaki

Kadowaki (2018) takes issue with Saari's conclusions, claiming his analysis is "flawed." Kadowaki claims 1) "that Saari's *explanation* for the effectiveness of his counterexample is incorrect" (emphasis added) and 2) "that his counterexample [to the application of Equation (1)] fails to address the standard methods used to model galaxies…[and he has] misrepresented these methods."

Concerning his first claim, he points out that Equation (1) assumes a *spherically symmetric* mass distribution and argues that the reason it fails for central configurations is that they are *not* spherically symmetric. He claims its failure has nothing to do with the mass distribution being discrete as opposed to continuous. He claims further that if Saari's contention is correct, then a) Equation (1) *should* be a good approximation for a continuous non-spherical distribution, and b) Equation (1) *should not* be a good approximation for a discrete spherically symmetric distribution.

As a counterexample for a), Kadowaki provides an example that is a *continuous* distribution which, due to non-spherical symmetry, is *not* well-described by this equation. This example starts with a spherical potential and stretches the x-axis ($x \rightarrow kx$), compresses the y-axis ($y \rightarrow y/k$), and leaves the z-axis unchanged. He states, "The resulting potential will trace a distribution in which the rotation curves along these axes are significantly different and cannot all be consistent with Equation (1)."

As a counterexample for b), he provides an example of a spherically-symmetric but *discrete* distribution which *is* well-described by the equation. In this example, he uses a distribution of 3072 unit point masses on each of 20 equally spaced concentric spheres. He then shows that Equation (1) gives a good approximation to the actual mass and concludes that Equation (1) works in this case because of the approximate spherical symmetry.

Concerning Kadowaki's second claim (Saari's misrepresentation of methods to model galaxies), he notes, "Physicists and astronomers are, in fact, aware that galaxies are not spherical, and adjust their methods appropriately," and cites several examples from the literature, including the one used by Rubin and Ford (1970) to model galaxy M31. Recall that when discussing Potential Theory above, we pointed out nearly ten different shapes that have been modeled. Kadowaki presents a disk potential given by Binney and Tremaine (2011) that approximates spiderweb configurations using a continuous distribution and shows that for a particular spiderweb configuration ($n = 50$ rings, $k = 100$ spokes, $r_i = i$, and $m = 1$ for all masses), the resulting potential gives a good approximation to the actual potential. He concludes that Equation (1) "does not play the central role that Saari contends" and that Saari uses an "oversimplified straw-man" of the standard methods of rotation curve analysis.

Furthermore, Kadowaki shows that astrophysicists have methods for estimating the impact of discreteness, which show this impact is negligible. In particular, he refers to Binney and Tremaine (2011), who estimate the amount of deviation a star will undergo as it crosses a galaxy and then estimate the number of crossings needed to have a deviation of the same order as its original velocity. They call the time for this number of crossings the relaxation time, below which the galaxy can be treated as collisionless and presumably well approximated by a smooth continuous potential. This relaxation time turns out to be more than 10^9 Myr, much longer than the (accepted evolutionary) age of the universe, so Kadowaki concludes smooth approximations are well-justified.

Kadowaki's overall conclusion is that "Saari has failed to make a compelling case for errors in standard methods for analyzing rotation curves—and, moreover, that his case relies on a misunderstanding of these methods and a severe underestimation of their complexity and scope. Thus, his skepticism about inferences drawn by these methods—namely, regarding the existence of dark matter—is entirely unwarranted."

Some Thoughts on Kadowaki's Refutation

Kadowaki admits that "Saari has successfully cast doubt on the ability of Equation (1) to accurately model large N-body systems in general…[and that] Saari's proof still shows that Equation (1) will fail to accurately model some distributions that lack approximate spherical symmetry." One conclusion that creation scientists can draw from this is that Equation (1) does have its limitations, which need to be considered before applying it to derive galactic mass from rotation curves.

Having said that, we now consider Kadowaki's refutation in some detail.

Edge Effects

As seen in the list that follows, Saari makes the point, more than once, that he is addressing stars near the outer edge of galaxies (emphasis added in all quotations):

- "dragging would tend to affect *bodies farther out*, which suggests the possibility of exaggerated mass predictions *for larger distances from the center* [of the galaxy]"
- "the observed flattening of rotational velocities implies *for large r values*…"
- "particles *on the galactic edges*"
- "this is particularly true *for larger r values on the outer fringes* of the solution."

Consider the following regarding these large r values (edges):

Binney and Tremaine (1987), Section 3.2, say: "Stars whose motions are confined to the equatorial plane of an axisymmetric galaxy have no way of perceiving that the potential in which they move is not spherically symmetric." The "Saari" (spider-web) configurations are confined to the equatorial plane of axisymmetric galaxies, so this applies to them.

From a more recent online textbook on galactic dynamics, Bovy (2023), we read:

- Section 8.2: "*At large distances*…the potential and force approach that of the spherical shell, which is the same as that of a point mass. This is a general rule for mass distributions of finite mass: *at large distances* their force becomes indistinguishable from that of a point of the same mass." (Emphasis added.)
- Chapter 8: "even for very flattened systems, like disk galaxies, the circular velocity is of a similar magnitude *as if the flattened mass were distributed_spherically*. So the circular velocity measures the mass distribution well even for such systems." (Emphasis added.) The motion of the Sun in the Milky Way is given as an example of assuming that the mass within the solar orbit is distributed spherically and the enclosed mass is shown to be "actually quite accurate!", when compared to the mass obtained when using a sophisticated mass model for the Milky Way.
- Section 8.1: "the radial profile may deviate from the pure exponential profile *in the inner or outer ranges of the disk*"
- Section 8.3.2: "the rotation curve of any finite-mass disk will tend to the Keplerian behavior $v_c \propto R^{-1/2}$ *at large distance*." (Emphasis added.)

It seems that for the objects Saari is considering, i.e., those on the outer edges of galaxies, Equation (1) should be a good model.

Kadowaki's Example of a Continuous, Non-Spherically Symmetric Distribution

Bovy (2023) claims that "many useful insights in galactic dynamics can be obtained by approximating mass distributions as easy-to-work-with spherical distributions." He offers a general rule that disk rotation curves "are largely set by the *overall* radial behavior of the mass distribution and only mildly dependent on its shape." (Emphasis added.) This seems to vindicate Saari's choice of Equation (1) as representative of *a* standard approach to rotation curves, even though it was derived assuming spherical symmetry, especially, as we just discussed, he applies it at the edges.

Tugging

The discussion in Binney and Tremaine (1987), Section 4.1, is apropos to Kadowaki's estimate of what he calls local variations. In this section, they address the case where two stars approach in a manner that changes the velocity of the approaching star by only a few percent ($\delta v/v \ll 1$) and the perturbing star is almost stationary during the encounter. They conclude that stellar encounters are unimportant for a star crossing a typical galaxy. This is *not* the case Saari considers. He considers stars *near the edge* of the spiral galaxy that are moving essentially parallel to one another, with the inner star moving faster than the outer star. Section 7.1 of Binney and Tremaine (1987) is applicable here. They consider a test star of mass M moving in a field of stars, each of mass m, considered individually. They show that a "dynamical friction" force is exerted on M by slower-moving stars, causing M to decelerate. By Newton's Third Law, there is an opposite force exerted on m, which will be Saari's "tugging" force.

Kadowaki's Spiderweb Counterexample

In order to show that Saari "fails to address the standard methods used to model galaxies…[and he has] misrepresented these methods," Kadowaki uses a disk potential taken from Binney and Tremaine (2011) to approximate spiderweb configurations. The example he uses was described above: 50 rings and 100 spokes evenly spaced with $r_i = i$ and $m_i = 1$ for all rings. The integral equation for the potential requires the surface density of the mass distribution, $\Sigma(R)$. He uses a coarse-graining procedure to approximate $\Sigma(R)$. But this surface density can be easily computed for the given configuration and shown to be inversely proportional to radius. Such a surface density is known as "Mestel's disk," whose circular velocity equation is "precisely analogous" to the circular velocity for a spherical system, i.e., Equation (1) (Binney and Tremaine, 1987). Even though Kadowaki's intention was to show how well the approximate and actual potentials agree, which he did, the example he uses is another example of where Equation (1) applies to a distribution that is not spherical but planar.

Concluding Thoughts on the Refutation

From Section 3.0 of Bovy (2023): "even though mass distributions can be quite far from spherical, <u>many of the properties of non-spherical distributions can be understood by approximating these distributions with some equivalent spherical distribution.</u> Similarly, many of the concepts that we will introduce in this chapter (like…*circular velocity*) <u>remain similar for non-spherical distributions</u>." (Italics in original; underline added.)

It seems Equation (1) *does* "play the central role that Saari contends" and that Saari's "oversimplified strawman" of the standard methods of rotation curve analysis is not really so oversimplified after all. Indeed, in the introductory section of Saari (2015), he refers to this as "*a* standard method" (emphasis added) and in the section titled "Standard Approach" he explicitly states, "There are more sophisticated ways to estimate $M(r)$, but Equation (1) is *a* standard approach." (Emphasis added.) Saari is aware of these more rigorous approaches but seems justified in using Equation (1), especially to describe the dynamics at

the outer edge of galaxies. Nonetheless, Equation (1) should be used with caution. Saari's arguments show it should apply to the outer edges of galaxies but its use elsewhere needs to be justified.

Some Comments on Rotation Curves in General

Mass-to-light ratio

We read in Bovy (2023), Section 8.1: "To take observations of the surface-brightness profiles of disk galaxies and jump to the conclusion that the distribution of *stellar mass* in disks declines exponentially requires an additional assumption." This assumption is that stellar mass traces observed luminosity with a constant scaling called the *mass-to-light ratio*, which allows the observed luminosity to be converted to stellar mass. *Theoretical* mass-to-light ratios are computed based on evolutionary assumptions ("models for the relative proportion of different stars born from a molecular cloud in a star-formation event (the *initial mass function*) and models of stellar evolution"). He points out that "light is a very biased tracer of mass: the light in most bands is dominated by luminous, relatively high-mass stars (mass of the Sun or higher), while the mass budget is dominated by the lowest mass stars (far below the mass of the Sun). *It is therefore not obvious that the stellar mass profiles of disks are also exponential*." (Emphasis added.)

Magnetic Effects

Magnetic effects might influence the rotation speeds of gas in the outer regions. According to Nelson (1988): "The crucial point here is that where the rotation curves are anomalously high, the density of the HI gas drops to very low values, and this may significantly alter the energy balance between magnetic energy and rotational energy. Consequently, *in the outer parts of galaxies, the galactic magnetic field may play a primary role in large-scale gas dynamics, and the gas streamlines are not simple gravitational orbits*." (Emphasis added.)

Admittedly, this is an older article, but there have been more recent papers on this effect (which papers, by the way, reference this work by Nelson). See Beck and Wielebinski (2013), Khademi et al. (2023), and references therein. These magnetic effects could provide an explanation for the behavior of the outer portions of the galactic rotation curves.

A Creationist Conjecture

According to Saari (2005): "with appropriate initial conditions, any coplanar *N*-body central configuration can be placed into a circular…orbit that preserves the configuration; the motion keeps the shape while assuming different scale or rotation values." That is, if this configuration is *put* in circular rotational motion, it will maintain its shape. Saari (2005) also points out that for *any* choice of masses, we can find configurations and velocities that form central configurations. Neither geometric symmetry nor equal masses are required for central configurations, i.e., central configurations do not have to look like spider-web configurations. This leaves open the possibility that these galaxies were, in fact, *put* in (stable) central configurations when created, but deviated from them after the Fall and its effects on the cosmos.

On a cosmological scale, though not from a creationist perspective, Barbour (2020) introduces central configurations of the homothetic type, i.e., those encountered in collisions or "explosions" and applicable to three-dimensional motion rather than being limited to planar structures and motion like the Saari spiderweb central configurations discussed above (and see Appendix A). These have been proposed in models of the entire universe. For example, Gibbons and Ellis (2013) "consider a Newtonian cosmology for a universe made up of discrete gravitating particles. We do not assume either general relativity or fluid dynamics. We just use Newton's Laws of motion applied to a set of gravitating particles, with the particle interactions given by Newton's law of gravitational attraction." This approach should be welcomed by creationists and should be explored as a possible basis for creationist astronomy and cosmology.

Acknowledgements

The author gratefully acknowledges comments from two anonymous reviewers, one of whom pointed out the existence of Kadowaki's paper and suggested modification of the original submission. These have been incorporated in the present paper.

Appendix A. Central Configurations

Saari (2005) shows that central configurations (to be defined below) should be common in the Newtonian N-body problem, of which galaxies and the cosmos at large are examples. He starts with the usual equations of motion

$$m_j \mathbf{r}_j'' = \sum_{j \neq k} \frac{m_j m_k (\mathbf{r}_k - \mathbf{r}_j)}{r_{jk}^3}, j = 1, \ldots, N \quad \text{(A.1)}$$

where m_j and $\mathbf{r}_j$ are the mass and position vector of j^{th} particle, j = 1,…,N; r_{jk} is the magnitude of $\mathbf{r}_k - \mathbf{r}_j$; the double prime indicates the second derivative with respect to time; and position is with respect to the center of mass. (Note that Saari usually works in units where the universal gravitational constant G = 1.) Saari defines the self-potential (negative of the potential energy)

$$U = \sum_{j<k} \frac{m_j m_k}{r_{jk}} \quad \text{(A.2)}$$

Then the equations of motion become

$$m_j \mathbf{r}_j'' = \frac{\partial U}{\partial \mathbf{r}_i} = \left(\frac{\partial U}{\partial x_i}, \frac{\partial U}{\partial y_i}, \frac{\partial U}{\partial z_i}\right), j = 1, \ldots, N$$

$$\mathbf{r}_j'' = \frac{1}{m_j}\frac{\partial U}{\partial \mathbf{r}_j} \qquad \text{(A.3)}$$

Saari notes that it would be much simpler "if we could replace this equation with one that looks like"

$$\mathbf{r}_j'' = \lambda \mathbf{r}_j, j = 1, \ldots, N \qquad \text{(A.4)}$$

He says further that "for *any* choice of masses, choices of configurations and velocities can be found that allow this…replacement." (Saari, 2005, p. 35; emphasis added.) He then defines a *central configuration*:

The N-particles form a central configuration at time t if there exists a scalar λ so that

$$\lambda m_j \mathbf{r}_j = \frac{\partial U}{\partial \mathbf{r}_j}, j = 1, \ldots, N \qquad \text{(A.5)}$$

In words, "A central configuration occurs whenever the particles line up in the particular fashion where each particle's position vector is the same scalar multiple of the particle's acceleration vector…[T]hese configurations tend to arise whenever the same configuration is rigidly preserved during the motion, or whenever the N-body gravitational pressures force a 'balancing' among the limiting behaviors of the particles." (Saari, 2005, p. 35)

If a configuration is preserved during motion, it is called homographic motion. A special case of homographic motion is where the solutions behave like a rotating rigid body. If the particles are constrained to move along straight lines passing through the center of mass of the system, the motion is called homothetic.

Saari shows that:

- Galaxies within a group of galaxies tend to form central configurations, and
- Particles moving in a plane, behaving like a rigid body, *must* form a central configuration

Saari defines *I* as one-half the polar moment of inertia. For a central configuration:

$$I = \frac{1}{2}\sum_{j=1}^{N} m_j \mathbf{r}_j^2 \qquad \text{(A.6)}$$

Saari then shows that the constant, λ, is given by:

$$\lambda = -\frac{U}{2I} \qquad \text{(A.7)} \qquad \text{(A.7)}$$

Furthermore, for central configurations that rotate like a rigid body, each particle's trajectory is given by

$$z_j(t) = a_j e^{i\omega t}$$

or

$$z_j''(t) = -\omega^2 a_j e^{i\omega t}$$

This has the form of Equation (4), so we can see that in this case, $\lambda = -\omega^2$.

Saari (2005) proves a theorem that says that for a central configuration, if there is rotation, then the motion is coplanar, i.e., the particles must be in a plane, and if the configuration is not coplanar, there must be no rotation and the motion is homothetic, i.e., the particles are constrained to move along straight lines passing through the center of mass of the system.

Additional insight into central configurations is provided by Barbour (2020). He defines the Newton potential, V_{New}, the root-mean-square length, l_{rms}, and the mean harmonic length, l_{mhl}:

$$V_{New} = -G\sum_{a<b}\frac{m_a m}{r_{ab}}$$

$$l_{rms} = \frac{1}{M}\sqrt{\sum_{a<b} m_a m_b r_{ab}^2}$$

$$\frac{1}{l_{mhl}} = \frac{1}{M^2}\sum_{a<b}\frac{m_a m_b}{r_{ab}} = -\frac{1}{M^2}V_{New}$$

He then defines the *shape complexity*

$$shape\ complexity = \frac{l_{rms}}{l_{mhl}}$$

$$= -\frac{l_{rms}V_{New}}{M^2}$$

In these equations, *M* is just the total mass in the system. The shape complexity is a pure number and depends only on the mass ratios of the particles and the shape of their distribution. The two factors that define the shape complexity change in different ways if two or more particles move closer to each other. For a system with many particles, l_{rms} hardly changes, but V_{New} changes considerably.

Barbour also defines the *shape potential*, V_{shape}, as the negative of the shape complexity. He attributes the expression "shape potential" to N-body specialists and says that central configurations can exist only where complexity has an extremum (maximum, minimum, or saddle point). Basically, the same mathematical formula characterizes both the structure (complexity) and the shape potential (the potential for change through gravity).

Barbour notes that exactly symmetric central configurations are rare and atypical. He also notes that as the number of particles increases, the number of central configurations increases rapidly and might form a continuum of possible shapes, i.e., *central configurations might not be rare*.

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"Lucy" and the Pygmy Human Hypothesis

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Key Words: A.L. 288-1, *Australopithecus afarensis*, Hadar Ethiopia, "Hobbit," LB 1, Lucy, Paleoanthropology, Pygmy Human Hypothesis

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Abstract

There are two primary views within the creation community with respect to the taxonomic identity of "Lucy" and her kind, *Au. afarensis*. The first view posits Lucy and her species were an extinct quadrupedal ape. Adherents of this view (Quadrupedal Ape Hypothesis) focus on the ape-like features of specimens assigned to the *Australopithecus* genus and reinterpret features which suggest human-like obligate bipedality. Meanwhile, there is a growing number of creationists who recognize bipedal morphologies in the partial skeleton of Lucy and the broader *Australopithecus* genus. Proponents of this second view (Bipedal Ape Hypothesis) argue Lucy's kind had an ape-like cranium yet walked upright in a manner similar to modern humans. In this paper, several reputed *"Australopithecus*-like" traits are examined and compared to features found in small-bodied adult human paleontological specimens such as the Flores "Hobbit" and *H. naledi*. Features commonly interpreted as indicators of arboreal propensities are found in these small-bodied adult humans. Since these same traits occur in humans, they cannot be considered diagnostic of *Australopithecus* taxa. This paper further identifies features in Lucy's skeleton that are entirely consistent with *H. sapiens*. These findings call into question the taxonomic assignment of numerous human-looking fossils attributed to *Australopithecus.* These lines of evidence support a new hypothesis, that Lucy was a genetically isolated small-bodied human, drawn from a pygmy population that lived in the Hadar region of East Africa, during the post-Flood African Humid Period (Pygmy Human Hypothesis).

Simple Summary

The article proposes the Pygmy Human Hypothesis, arguing that the fossil "Lucy" (*Australopithecus afarensis*) was not an extinct ape, but rather a genetically isolated, small-bodied adult human belonging to a pygmy population that lived in East Africa. This perspective is introduced as a third option beyond the traditional creationist views that Lucy was either a quadrupedal ape (Quadrupedal Ape Hypothesis) or an ape that walked upright (Bipedal Ape Hypothesis). The author supports this hypothesis by highlighting that Lucy's anatomy contains several features exclusive to human bipedalism, particularly her pelvis, which is short, wide, and bowl-shaped with specialized parts for upright walking, and her ankle joint, which is described as "fully bipedal." Furthermore, Lucy shares several unique traits—including nearly identical limb proportions and small endocranial capacities (brain size)—with *Homo floresiensis* (the "Hobbit"), a fossil widely considered a small-bodied human. The author also contends that many traits often used to classify Lucy and similar fossils as ape-like (such as curved fingers, funnel-shaped thoraxes, or laterally flaring ilia) are unreliable because they have also been found in known human fossils, including the Hobbit and *H. naledi*. Therefore, the paper suggests that Lucy's classification as *Australopithecus* led to the systematic misclassification of numerous other human-looking fossils.

Introduction

Ever since Johanson's announcement of a new species at the Nobel Symposium in Sweden in 1978 (Johanson et al., 1979; Königsson et al., 1980), "Lucy" and the species she is claimed to represent, *Australopithecus afarensis*, have been promoted as the most likely root ancestor to the genus *Homo* (Figure 1). Over the past 50 years, few hominin discoveries have received more publicity than Lucy. The partial skeleton A.L. 288-1 is promoted as the quintessential "missing link" fossil in textbooks, museum displays, and popular science media outlets around the world. Given its prominence in the evolutionary paradigm, understanding where Lucy fits in the Biblical worldview is a question of vital importance.

Creationists have traditionally responded to these evolutionary claims by arguing Lucy is nothing more than an extinct ape (Quadrupedal Ape Hypothesis) while downplaying the purported bipedal morphologies in Lucy's skeleton and in the broader genus (Menton, 2003; Oard, 2013). However, there is a growing number of creationists who have recognized certain features that indicate bipedality (Brummel, 2023). Proponents of this idea argue that Lucy's kind was an obligate biped with a human-like postcranial anatomy, perhaps with some arboreal traits, and an ape-like cranium (Bipedal Ape Hypothesis).

Until recently, creationists have never seriously considered a third possibility, that Lucy was a small-bodied human (Pygmy Human Hypothesis). Indeed, the purported suite of ape-like morphological features among australopithecine specimens—e.g., curved phalanges, limb proportions, thorax shape, laterally flaring ilia, cranially oriented glenoid cavities, endocranial capacities, etc.—appears to preclude any possibility of human identity. In this study, a qualitative approach was used to compare key anatomical features of Lucy's skeleton with other hominin taxa and extant apes. Many of the features commonly reported as ape-like were found to be present in the small-bodied adult human from the Indonesian island of Flores, *H. floresiensis*, and to a lesser extent, in *H. naledi*. Together, these analyses support the interpretation that Lucy was a genetically isolated small-bodied adult human, drawn from a pygmy population that lived in the Hadar region of East Africa, during the post-Flood African Humid Period.

The Anatomy of Lucy

Lovejoy's Reconstruction of Lucy's Pelvis

There is a popular PBS Nova clip that shows evolutionary anatomist, Owen Lovejoy, using a grinding saw to correct the damage on Lucy's ilium (Johanson, 1997). This clip has been played and replayed by many creationists as Christian audiences laugh at the sight of Lovejoy grinding the plaster replicas to "reshape" the ilium the way he wanted to promote Lucy as a credible "missing link" fossil. The allegation that creationists have made is that Lovejoy deceptively manipulated Lucy's iliac crest to make it appear more like a human, and he allegedly did so in full view of millions of viewers during a major television broadcast. It has been argued that the unreconstructed ilium (before the grinding saw) looked a lot more like a chimp with coronally oriented ilia, as opposed to more sagittally oriented, like in humans.

The allegations of fraud or a manipulated reconstruction do not stand up to scrutiny. Fossil casts of Lucy's os coxae (hip bone or pelvic bone) with the unrestored portion of the ilium can be purchased online. Anyone who has examined it will immediately recognize why it was necessary for Lovejoy to reconstruct the sacroiliac joint (Lovejoy, 2005a). That part of the ilium is badly damaged (Figure 2A), and obviously so—when one fits it to the sacrum, it rotates the os coxae such that the ischium ("sit bone") and pubis point straight out from the body and perpendicular to the sacrum, which is an anatomical impossibility (Figure 2B). It is only in this incorrect position that the iliac blades lay flatter, superficially, like that of a chimp. The "artificial joint" that formed as a result of the damaged sacroiliac joint has been described elsewhere by Johanson (Johanson et al., 1994).

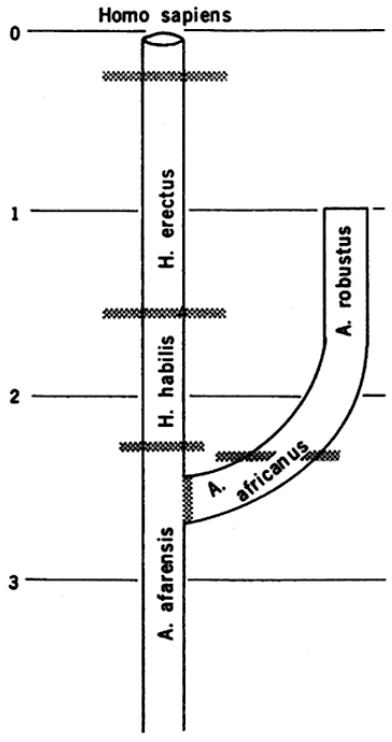

Figure 1. Johanson and White's tree diagram with *Au. afarensis* positioned at the stem, representing the immediate ancestor to early *Homo* and all descendant species of the genus, including *H. sapiens*. From: Johanson and White (1979).

Ape and Human Pelvises Are Morphologically Distinct

Functional anatomists universally acknowledge that "perhaps no anatomical structure between human and apes shows a more striking difference than that of the pelvis" (Zirkle, 2015). Lovejoy and Spurlock (2009) write similarly: "Virtually no other primate has a human-like pelvic girdle—not even our closest living relatives, the chimpanzee and bonobo."

The most obviously recognizable differences are seen in the overall shape of the pelvis (Lovejoy, 2005a; Gruss and Schmitt, 2015). The human pelvis is characteristically described as "short, wide, and basin-shaped" (Aiello and Dean, 1990). The human ilium itself is also distinct from apes (Wall-Sheffler et al., 2019). Zirkle and Lovejoy (2019) write, "The human ilium is unusually short and broad compared with those of all other primates." In contrast to the "greatly shortened" ilium in humans (Lovejoy and McCollum, 2010), the ilium of apes is flat and "exceptionally long" such that the blades entrap the lower lumbar vertebrae (Lovejoy, 2005a; Gruss and Schmitt, 2015; Zirkle and Lovejoy, 2019). These differences are equally dramatic in lateral view (Whitehead et al. 2005; Lovejoy, 2005a; Lovejoy and Spurlock, 2009; Wall-Sheffler et al., 2019). As Zirkle (2015) observes:

> "The stark contrast between human and African ape pelvises is appreciable as the human iliac isthmus is generously expansive. A lateral view of an African ape pelvis is nearly two-dimensional in appearance with only a slight iliac isthmus expanse."

The shape of the human sacrum is, likewise, markedly different from African apes. The human sacrum is shorter and wider compared to the "extremely narrow," straight sacrum of African apes (Aiello and Dean, 1990; Whitehead et al., 2005; Lovejoy and McCollum, 2010; Gruss and Schmitt, 2015; Zirkle, 2015; Wall-Sheffler et al., 2019). Each of these visually distinctive features in human and ape pelvises relates to their differences in locomotory behavior (Aiello and Dean, 1990; Wall-Sheffler et al., 2019).

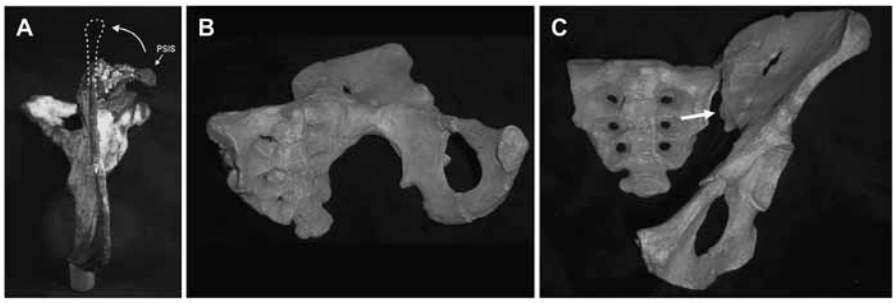

Figure 2. Reconstruction of Lucy's pelvis. (A) Lucy's unrestored iliac crest is viewed from above (superior view). Lovejoy (2005) describes the fossil damage: "While much of the iliac blade is well preserved, the posterior third has been crushed, crumpled, and bent anterolaterally almost 90°." The damaged portion includes the auricular surface that joins to the sacrum. From: Lovejoy (2005). (B) Lucy's sacrum joined together with the false joint of the ilium rotates the os coxae outward into an impossible orientation. From: M. Murdock (2006). (C) When left uncorrected, there is a small gap between the sacrum and the auricular surface of the ilium (right; arrow). From: M. Murdock (2006).

Lucy's Pelvis Preserves Several Exclusively Human Traits

Although Lovejoy's reconstruction of the sacroiliac joint remains controversial among creationists, the overall morphology of the pelvis is determined by more than just the sacroiliac joint. The shape is the result of the integration of several parts including the sacrum, ischium, pubis, and the larger, better-preserved part of the ilium.

Lovejoy's restoration did not alter the sacrum, which was found intact and well preserved with limited distortion, concentrated on one side and correctable by mirror imaging. The sacrum of primates with their characteristic narrow, elongated shape is morphologically distinct from humans (Whitehead et al., 2005). The shape of Lucy's sacrum is shorter and wider, consistent with humans and distinctly different from apes (Lovejoy, 2005a; Chene et al., 2015) (Figure 3). Moreover, the sacrum preserves inward curvature (sacral lordosis) that is described as "virtually identical" to modern humans, permitting fully human posture and gait (Lovejoy, 2005a). A reexamination of the vertebrae by Russo and Williams (2015) further indicates Lucy had five fused sacral vertebrae, the common condition seen in modern humans (Aiello and Dean, 1990).

The ilium itself is also morphologically human. Plots comparing the relative iliac height of Lucy's pelvis to apes support this claim; Lucy falls neatly within the human range and well outside the range of apes (Zirkle and Lovejoy, 2019). Even accounting for the damaged region to the ilium, the dimensions reveal it is wider than it is tall, which is unique to humans and the reverse of apes (Straus, 1929; Aiello and Dean, 1990; Whitehead et al., 2005; Zirkle, 2015; Wall-Sheffler et al., 2019). As a result of expanded ilium breadth, humans have a deeper greater sciatic notch compared to apes (Whitehead

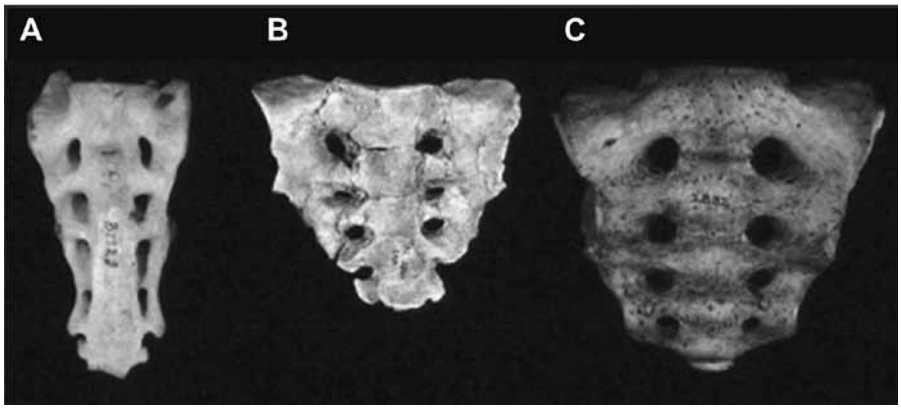

Figure 3. Anterior view of sacra belonging to (A) chimpanzee (*P. troglodytes*), (B) Lucy (A.L. 288-1an), and (C) *H. sapiens*. The narrow, elongated sacrum of chimps is distinct from the shorter, wider sacrum of Lucy and modern humans. From: Lovejoy and McCollum (2010).

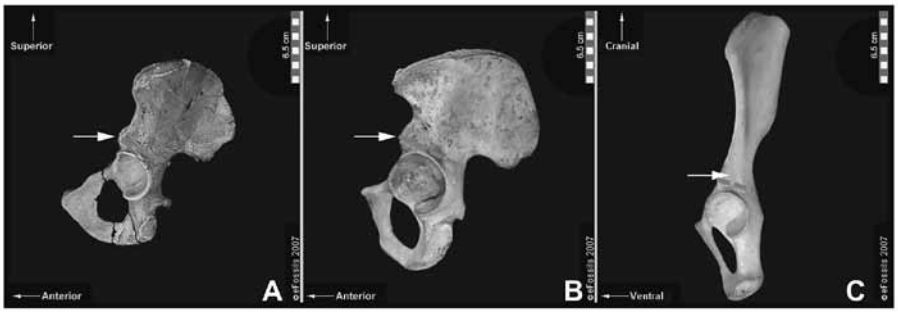

Figure 4. Lateral view of os coxae. Both Lucy's (A) and *H. sapiens* (B) os coxae preserve the bony prominence of a "true" AIIS (white arrows). The equivalent site is flat in chimps (C). The relative iliac isthmus breadth is also markedly wider in Lucy compared to chimps and is morphologically similar to humans (red line). From: https://elucy.org/compant/oscoxae/.

et al., 2005). This may be considered another distinguishing feature that is apparent in Lucy's pelvis (Lovejoy and Spurlock, 2009). In addition, there is no "capture" of the lower lumbar vertebrae by the iliac blades, as seen in African apes (Lovejoy, 2005a).

In the undamaged part of the ilium, there is a bony prominence known as the anterior inferior iliac spine (AIIS). The AIIS is on the front of the ilium and anchors the quadriceps muscle in the front of the thigh, called the rectus femoris muscle, also known as the "kicking muscle." It is critical for knee extension and assists in hip flexion—the ability to lift our leg forward at the hip joint. It plays an important role in walking, running, kicking, and lifting the knee to walk up steps. In concise technical terms, the rectus femoris muscle "contracts during the 'toe off' portion of swing phase in bipedal locomotion." (Zirkle, 2015). Humans preserve a specialized AIIS to facilitate muscle attachment. The equivalent region of the AIIS in chimps is flat (Figure 4).

In some ape taxa, such as gorilla and the extinct quadrupedal ape, *Oreopithecus bambolii*, a bony prominence may be present (Harrison, 1986). However, ape prominences are not considered to represent a "true" AIIS like in humans (Zirkle, 2015; Zirkle and Lovejoy, 2019). Consistent with this evaluation, paleoanthropologists now reject earlier studies that argued *O. bambolii* was a habitual biped (Susman, 2005; Russo and Shapiro, 2013). The equivalent region of the AIIS in apes can be distinguished from humans by the absence of a secondary ossification center that is exclusive to obligate bipedal hominins (humans) (Lovejoy and McCollum, 2010; Zirkle, 2015; Zirkle and Lovejoy, 2019). Lovejoy and McCollum (2010) explain:

> "The degree of protuberance of its AIIS is not unusual for a non-hominid. What distinguishes the AIIS in hominids from those in apes is not its protuberance (those of Gorilla are often very prominent), but rather its emergence from a novel, separate physis, a hominid adaptation that is almost certainly associated with dramatic expansion of iliac isthmus breadth." (Lovejoy et al., 2009b)

A proxy for determining whether a fossil specimen bears a "true" AIIS is relative iliac isthmus breadth. In the lateral view, the human os coxae is morphologically distinct from apes: "the human ilium is significantly shorter and broader than those of all other primates." (Zirkle and Lovejoy, 2019). Measured in the lateral view, the relative breadth of the isthmus is significantly broader in humans when compared to African apes (Zirkle, 2015). Lovejoy and McCollum (2010), Zirkle (2015), and Zirkle and Lovejoy (2019) show that because this feature is so strongly associated with bipedal human pelvises and distinct from

the narrow isthmus of apes, it can be "reasonably used to determine the presence/absence of a true AIIS in extinct taxa for which there are no appropriate subadult specimens" (Zirkle, 2015). The iliac-isthmus expansion alone appears to distinguish true bipedal human pelvises from quadrupedal apes (Zirkle and Lovejoy, 2019).

Lucy's pelvis, as in modern humans, has an expanded iliac isthmus and "a protuberant AIIS that appears consistent in size, location, form, and orientation (anteromedial) with the hominid condition" (Zirkle, 2015) (Figures 4A and 4B). That part of the ilium (anterior border) is well preserved in Lucy and was unaffected by Lovejoy's reconstruction of the sacroiliac joint (Lovejoy, 2005a). The integration of all these parts forms a distinctly human-looking pelvis—it is short, broad, and bowl-shaped—looking nothing like the long, flattened pelvis of a chimpanzee (Gruss and Schmitt, 2015) (Figure 4C and Figure 5). The differences in morphology are apparent regardless of the photographic orientation of the pelvis.

Figure 5. Comparison of pelvic girdles in ape and hominin specimens. Top row: American Indian, Neanderthal (SH 1) from the "Pit of Bones" site in Spain, and chimpanzee. Bottom row: Lucy (A.L. 288-1ao-an), *H. erectus* (BSN 49/P27), and modern *H. sapiens*. Lucy's short, broad, and bowl-shaped pelvis looks distinctly different from chimpanzee. Notice the laterally flaring ilia in the American Indian and hominin *Homo* specimens. From: Lovejoy et al., 1973.

A "Blind" Reconstruction Corroborates Lucy's Human-Shaped Pelvis

The apparent bipedal characteristics of Lucy's pelvis are not dependent on Lovejoy's reconstruction alone. Schmid (1983) and Schmid and Häusler (1995) did their own reconstructions of Lucy's pelvis, and the overall shape did not dramatically differ from Lovejoy's (1979). It is distinctly human and not at all like an ape. The pelvis is short, broad, and bowl-shaped in all three reconstructions.

The differences between the various reconstructions are subtle and mostly relate to the precise dimensions of the birth canal, as part of an obstetric analysis (Figure 6A). Schmid and Häusler (1995) concluded that "Lucy" was a male, whom they nicknamed "Lucifer."

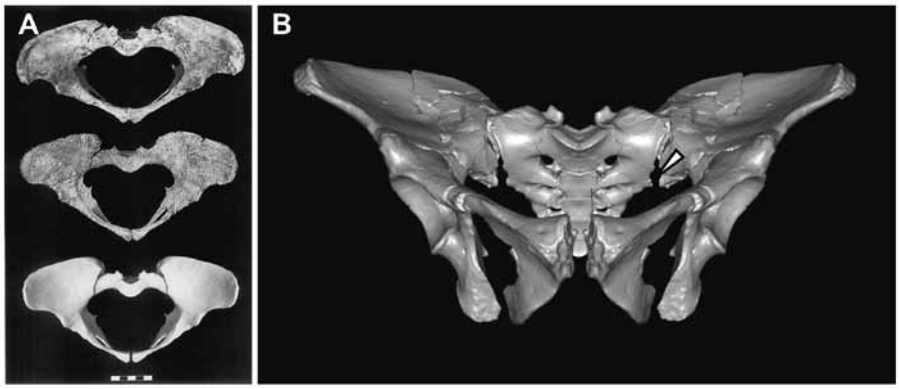

Figure 6. Various reconstructions of Lucy's pelvis. (A) Superior views of reconstructions from Lovejoy (1979), Schmid (1983) (a preliminary version), and Schmid and Häusler (1995) (top to bottom). Notice the consistency in the overall shape of the pelvis in these reconstructions. From: Schmid and Häusler (1995). (B) Frontal view of a "blind" reconstruction performed by O'Mahoney. Note the small gap between the auricular surface of the ilium and sacrum (arrowhead) due to the unrestored sacroiliac joint. From: Brassey et al. (2018).

These researchers rejected the sexual dimorphism hypothesis proposed by Johanson and colleagues and argued that Lucy's kind, *Au. afarensis* represents "several distinct species which were previously jumbled together."

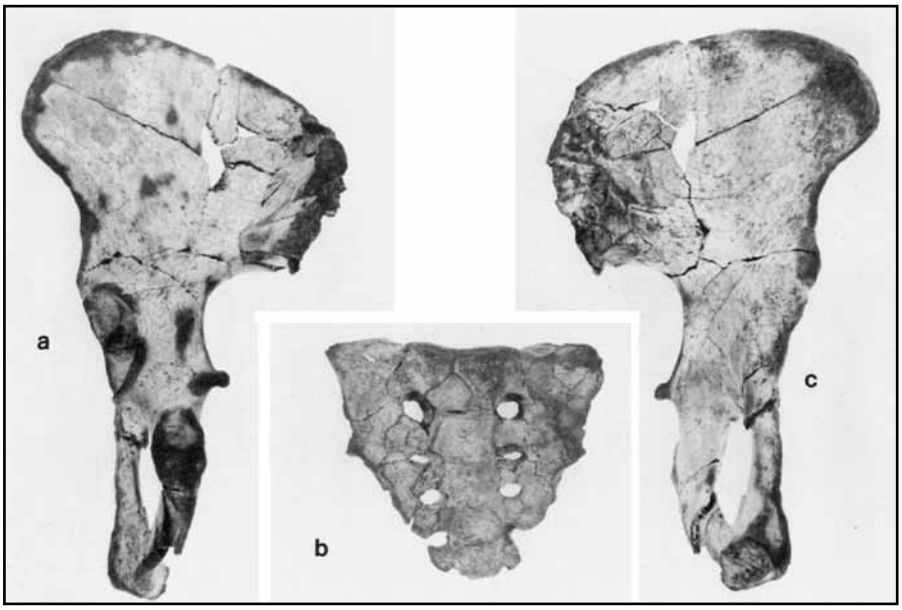

Figure 7. Lucy's intact sacrum (A.L. 288-1an) and assembled left os coxae (A.L. 288-1ao) with the sacroiliac joint unrestored. (A) Posterior view of os coxae; (B) anterior view of sacrum; (C) anterior view of os coxae. Notice the clean joins between the pieces of the os coxae with only small bits missing. From: Johanson et al. (1982).

A debate within the paleoanthropology community on "gender confusion in the Pliocene" ensued (Tague and Lovejoy, 1998). Tague and Lovejoy's obstetric analysis of Lucy's pelvis has remained unchallenged ever since. Today, the consensus in the paleoanthropology community is that Lucy really was a female. Regardless, the view that Lucy's pelvis is human does not hinge on any particular reconstruction since they all look distinctly human in morphology—nor does it depend on Lucy's gender. The pelvises of neither male nor female chimps look anything like the short, broad human pelvis.

A digital reconstruction of Lucy's pelvis was recently performed by Brassey et al. (2018) (Figure 6B). The original distortion to the sacrum that was concentrated on one side was mirrored to reveal its natural symmetry. In addition, the os coxae was reconstructed from its constituent pieces, using the internal arc as a guide. These researchers commented that "there is definitely crushing of the sacroiliac joint," however, they were able to reconstruct the pelvis without restoring the damaged part of the sacroiliac joint. This demonstrates that the human-like morphology of the pelvis does not depend on the reconstruction of the sacroiliac joint. Indeed, photographs of the os coxae prior to restoration of the sacroiliac joint show there are clear joins between the pieces of the pelvis (Johanson et al., 1982) (Figure 7), as can be seen in the digital model provided by Brassey et al. (2018), available for download here: //figshare.com/articles/dataset/Lucy_A_L_288-1_reconstructed_pelvis/4746886.

The overall human configuration of their reconstruction looks highly similar to the earlier reconstructions shown above. In fact, the co-author responsible for the reconstruction noted that he did so "blind" of the previous reconstructions to ensure an unbiased reproduction, yet he noted it happened to look remarkably similar to Schmid and Häusler's (1995) (T.G. O'Mahoney, personal communication, February 28, 2025). In terms of overall morphology, all four look distinctly human and not at all like a chimp or any other known primate.

In summary, the morphology of Lucy's pelvis bears several distinguishing features that are characteristic of human pelvises, including: 1) a short, broad, and bowl-shaped configuration 2) a short, wide sacrum; 3) short relative iliac height that is wider than it is tall; 4) a deeper greater sciatic notch; and 5) a specialized AIIS that is unique to obligate bipedal hominins (humans). As explained above, the presence of a "true" AIIS consistently correlates with an expanded iliac-isthmus breadth, which may be considered a sixth distinctive trait of human pelvises that is also represented in Lucy's pelvis. Other features that may not be considered conclusively diagnostic are nonetheless typical of modern humans and further corroborate this interpretation. These include the absence of "captured" lower lumbar vertebrae by the iliac blades, sacral lordosis, and five fused sacral vertebrae. The presence of all these traits combined in a single specimen strongly supports the human taxonomic identity of Lucy's pelvis.

Lucy's High Bicondylar Angle

Although the pelvis is the most definitive, it is just one in a suite of skeletal features which are characteristic of human bipedality. The bicondylar angle is the angle between the femur's shaft and a vertical line passing through the knee, perpendicular to the bicondylar plane. The bicondylar angle of quadrupedal primates "hovers around

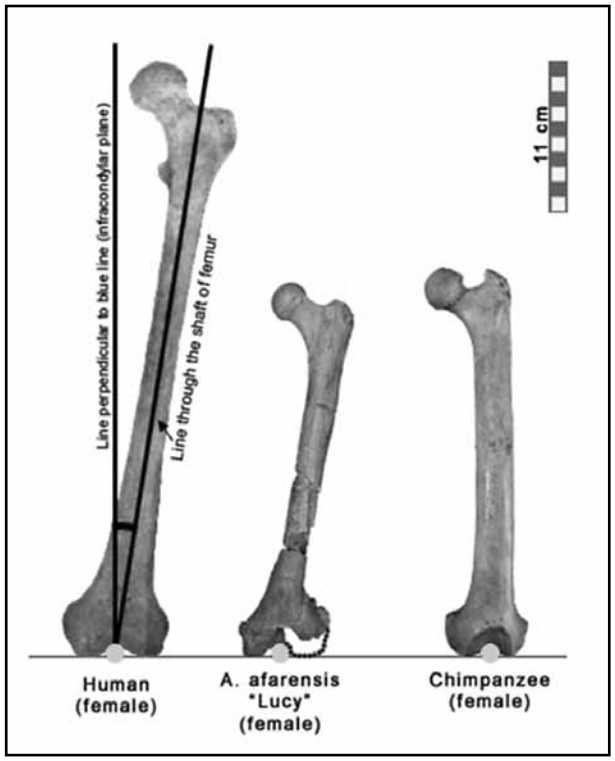

Figure 8. Lucy's high bicondylar angle falls within the human range. This feature combined with her human-shaped pelvis supports her true human identity. From: https://iho.asu.edu/about/lucys-story.

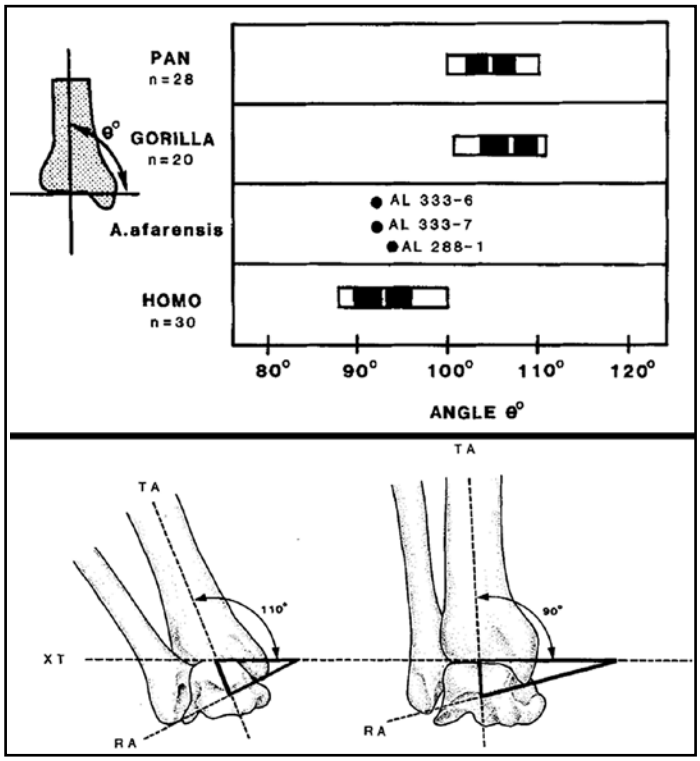

Figure 9. Top: The midline of the tibial shaft is nearly perpendicular to a midcoronal plane along the distal articular surface. In addition to Lucy's, the specimens from the "First Family" site (A.L. 333-6 and -7), fall in line with the mean value of the human range. This is consistent with the strikingly modern human-looking foot bones recovered from the same site (DeSilva et al., 2020; Johanson, 1976); and Johanson's original attribution of the "First Family" site to *Homo* (Johanson, 1976). Vertical white line = mean; black rectangle = ±1 S.D.; white bar = total range. Bottom: The human ankle configuration shown on the right forms a nearly perpendicular angle with the midshaft of the tibia and the distal articular surface, whereas in pongid an obtuse angle is formed. See Fig. 8 in Latimer et al. (1987) for a more detailed description.

a value of zero" whereas humans have a significantly higher bicondylar angle ranging between 8–11° (Lovejoy, 2007; Miller and DeSilva, 2023). Some creationists have argued that a high bicondylar angle is not a diagnostic feature when considered in isolation, since some primates have been shown to have higher bicondylar angles (Mehlert, 1996). However, Miller and DeSilva (2023) note that the bicondylar angle measured in humans is "at least one standard deviation above the largest angle seen among extant primates (5.3° in Macaca)."

Regardless of whether it is diagnostic of human bipedality, when a high bicondylar angle occurs in combination with other features that are distinctly human, such as the morphology of the pelvis and/or femoral condyles (i.e., raised patellar lip, deepened patellar groove, inferiorly flattened condyles, and elongation of the condyles in lateral view), the bicondylar angle is an important corroborating piece of evidence. The association of all those traits in a single distal femur is compelling evidence of human morphology and bipedality.

Unfortunately, Lucy's distal femur is damaged and does not provide an adequate lateral view of the condyles. However, Lucy's wider sacrum and broader, bowl-shaped pelvis correspond well with the higher bicondylar angle of her femur at 12° (Lovejoy, 2007; Miller and DeSilva, 2023), which places the center of gravity directly above her knees and feet, and closer to the midline of the body for stable bipedal locomotion (Figure 8).

Figure 10. Lucy's sacrum articulated with the os coxae of the small-bodied human from the Indonesian island of Flores. From: Jungers et al. (2009).

Lucy's Human-Like Ankle Joint

Lucy's talus was recovered together with the distal end of a fibula and a tibia. The ankle joint, technically referred to as the talocrural joint, is formed by the articulation of the distal tibia and fibula with the talus. The shape of Lucy's talus is robust and morphologically similar to modern humans and distinctly different from apes (Kappelman et al.), though it's smaller than an average adult human and comparable to the size of the small-bodied human, *H. floresiensis* (Pablos et al., 2013). In describing the talocrural joint of Lucy and comparing it to great apes and modern *H. sapiens*, Latimer et al. (1987) state, "In every functionally significant feature examined, the A.L. 288-1 talocrural joint is fully bipedal." One particular diagnostic feature they examined was the angle between the midline of the tibial shaft and the inclination of the distal articular surface, shown above (Figure 9). They note that "there is no overlap between pongid and hominid ranges, and this angle is nearly perpendicular in all hominin tibiae" (Latimer et al., 1987; Prang, 2015).

Lucy's Morphological Similarities to the Small-Bodied Human from Flores (Hobbit)

When Johanson first brought the skeleton to show anatomist Owen Lovejoy, Johanson asked, "You don't think it's a dwarf, do you?" Lovejoy reassured him saying, "Nah, the skeleton doesn't show any pathology. And what's more," Owen pointed to the leg bones, "these are about the same size as the knee joint from last year [A.L. 129-1]. I'll bet you the females were small and the males were large" (Johanson et al., 1994).

Lovejoy's response was interesting. He claimed that Lucy could not be a dwarf because the bones do not show any signs of pathology. That's a good response to a question about dwarfism, but why didn't they consider the possibility of a pygmy? Even today, there are populations of small-bodied humans living in central Africa. Pygmies don't suffer from dwarfism; they have naturally short stature and normal body proportions. Anthropologists define pygmies as populations in which adult males are on average less than 155 cm (~5′ 1″) in height (Migliano et al., 2007); females are a little shorter, so sexual dimorphism would not be dramatic. Males and females would both have small skeletons, and therefore small hips, small limbs, and small knee joints. Given the striking, human-like features found in A.L. 129-1, is it possible Lucy and other specimens from the Hadar Formation belonged to a population of pygmies? To examine this hypothesis, Lucy's skeleton was systematically compared to *H. floresiensis* (Hobbit), a fossil human of short stature.

The Pelvis of Lucy and the Hobbit

The late paleoanthropologist, William Jungers, from Stony Brook University, was astounded when Lucy's sacrum fit seamlessly with the sacroiliac joint belonging to the small-bodied human, *H. floresiensis*, from the Indonesian island of Flores (Jungers et al., 2009) (Figure 10). Jungers et al. (2009) report:

> "If one articulates casts of the sacra of australopithecines such as either AL 288-1 ("Lucy") or STS 14 (or a

> sacrum from a very small human) with LB1/7 in order to establish anatomical planes, one can better assess the degree of lateral iliac flare. The anterior margin of "Lucy's" sacrum fits remarkably well with the anterior edge of LB1/ 7's auricular surface (Fig. 4)."

The "remarkable" fit makes sense if we assume Lucy was an adult small-bodied human (the sacrum shows the complete fusion of the five sacral vertebrae). *H. floresiensis* is also widely considered an adult small-bodied human by creationists and evolutionary paleoanthropologists alike. In fact, the former head of Indonesia's national paleoanthropology institute, Teuku Jacob (Jacob et al., 2006), among other evolutionary paleoanthropologists (Hershkovitz et al., 2007; Berger et al., 2008), have argued that the Hobbit was a pathologic and/or inbred modern human pygmy (*H. sapiens*).

Jacob et al. (2006) have claimed the Hobbit was drawn from the Rampasasa pygmy population that still lives on the island, not far from Laung Bau cave, where Hobbit fossils were found. Pygmy populations are also thriving in the Congo Basin of Central Africa and may have lived in East Africa during the African Humid Period. And so, if both Lucy and Hobbit were small-bodied humans, it makes sense the two parts of the pelvis would fit together. It's only puzzling if they are assumed to belong in entirely separate genera, with two very different locomotor behaviors, as creationists have traditionally supposed. This is because the shape and size of the auricular surface of human ilia are unique, and do not fit the sacrum of quadrupedal apes for reasons directly related to their differences in locomotory behavior (Wall-Sheffler et al., 2019). Due to some fossil distortion to the sacrum, one might raise suspicions that the auricular surface was too severely deformed, and so the fit with the Hobbit's sacrum might have been fortuitous. However, Johanson et al. (1982) note that both auricular surfaces "appear in good condition." The auricular surface of LB1/7 likewise appears sufficiently well preserved, and Jungers et al. (2009) describe the fit of Lucy's sacrum with the auricular surface of the Hobbit's left os coxae (LB1/7) as anatomical.

The Limb Proportions of Lucy and the Hobbit

The limb proportions can be a useful proxy for distinguishing extant apes and humans, including fossil hominins. The limb proportions of the small-bodied human, Hobbit (LB 1), are reported in the scientific literature as a humeralfemoral index value (100 x humerus length/femur length). The humerus and femur length for LB 1 are 243 mm and 280 mm, respectively, yielding a humeralfemoral index of 86.8 (Jungers et al., 2016). The humerus and femur length for Lucy are remarkably close, 239 mm and 280 mm, respectively, yielding an index of 85.4 mm (Jungers et al., 2016). Interestingly, the humeralfemoral index for modern human pygmies ranges between 69.7–73.5 (Jungers et al., 2016). Thus, while the humeralfemoral length of Lucy differs from modern pygmies, the limb proportions of an ancient small-bodied human (LB 1) and Lucy are nearly identical.

The Thorax Shape of Lucy and the Hobbit

It is often assumed that Lucy had a conical or funnel-shaped thorax, as in apes (Leakey and Lewin, 1992; Line, 2010). However, some paleoanthropologists argue Lucy's thorax was more barrel-shaped. The fact that paleoanthropologists have a fundamental disagreement on this is not surprising. It may not be something that can be conclusively determined due to the fragmentary condition of Lucy's thorax. Brassey et al. (2018) acknowledge this, stating:

> "The subject of the shape of the *Australopithecus* thorax has been one of considerable debate (Schmid, 1983; Lewin and Foley, 2004; Haile-Selassie et al., 2010a, 2010b; Schmid et al., 2013; Latimer et al., 2016). Both a human 'barrel shape' and hominoid 'funnel shape' ribcage have been proposed for *A. afarensis*, with previous reconstructions being based on very limited fragmentary remains."

The fragmentary condition of the thorax explains why anatomists cannot confidently identify Lucy's rib numbers, aside from the first rib. Ironically, the only identifiable rib is described as looking distinctly like those of *H. sapiens* and different from what is observed in all primates (Johanson et al., 1982; Ohman, 1986; Kimbel and Delezene, 2009). Primates have two articular surfaces on the first rib; one articulates to the first thoracic vertebra and the other to the seventh cervical vertebra. Humans have a single articular surface on the first rib, which articulates with the first thoracic vertebra. Kimbel and Delezene (2009) note, "as in *H. sapiens*, the *A. afarensis* first rib [referring to A.L. 288-1ax and A.L. 333-118] has a single articulation with the first thoracic vertebra, as opposed to a "bivertebral" articulation, with the superior portion of the first thoracic centrum and the inferior portion of the seventh cervical centrum, as is observed in all nonhuman primates."

Regardless of how Lucy's thorax should be reconstructed, a funnel-shaped thorax is not exclusive to apes. Humans have been shown to have funnel-shaped thoraxes, including the small-statured *H. naledi* (Berger et al., 2015), Neanderthals (Tattersall, 2015), Turkana Boy (Hershkovitz et al., 2007), and pathologic modern humans (Hershkovitz et al., 2007). Indirect evidence suggests the Hobbit

may have also had a funnel-shaped thorax. Thus, even if Lucy's thorax was funnel-shaped, it cannot be considered diagnostic of *Australopithecus* nor of apes. Instead, it might count as yet another feature shared by the short-statured Hobbit.

Complicating things further, recent findings have suggested a barrel-shaped vs. funnel-shaped thorax is an "overly simplistic dichotomy" (Latimer et al., 2016; Williams, 2017). Consistent with this thinking, the latest reconstruction of Lucy's pelvis shows a more *bell-shaped* thorax (Brassey et al., 2018), as is seen in the "Big Man" skeleton[1] and other archaic humans such as Neanderthals with laterally flaring ilia (Latimer et al., 2016). Researchers have noticed there is an anatomical correspondence between flaring ilia and flaring lower thoraxes (Hershkovitz, 2007; Latimer et al., 2016). Given the observation that Lucy's first rib matches the human configuration, combined with her laterally flaring ilia, a bell-shaped thorax is likely the best approximation, as seen in other *Homo* specimens.

The Endocranial Capacity of Lucy and the Hobbit

The A.L. 288-1 cranium is highly fragmentary. Only six fragmentary pieces are preserved (A.L. 288-1a = occipital fragment, 1b = left parietal fragment, 1c/g = biparietal fragment, 1d = left zygomatic fragment, 1e = parietal fragment, 1h = right frontal fragment) (Johanson et al., 1982), which do not reveal any key diagnostic features of the skull, such as the foramen magnum orientation. Since most of Lucy's cranium is missing, her endocranial capacity cannot be directly measured (Johanson and Taieb, 1976). Estimates can range between 365-417 cc and are typically modeled based on ape endocranial capacities (Gunz et al., 2020). As a result, Lucy's endocranial capacity may be underestimated. Regardless, the upper estimate cited above is approximately the same as the pygmy human from Flores (380-426 cc) (Falk et al., 2005; Kubo et al., 2013), and so, it is entirely possible Lucy's cranium belonged to an adult, small-bodied human.

Lucy's cranial vault shape was likewise far too fragmentary to reconstruct without relying on composite skull reconstructions (Kimbel et al., 1984; Kimbell 1988), and later discoveries of more complete specimens as cross-references, such as the distinctly ape-like skull attributed to *Au. afarensis*—e.g., A.L. 444-2 (Kimbel et al., 2004). Consequently, the cranial vault shape of Lucy's skull is an open question and could be more human-like. For example, Ferguson (1987) challenged the earlier ape-like reconstructions and produced a more human-like rounded cranial vault with only moderate prognathism. On this basis, he rejected the *Australopithecus* designation and argued Lucy should be reclassified in the human genus as *Homo antiquus.*

Summary of Unique Features Shared by Lucy and the Hobbit

Lucy and the Hobbit have several unique features in common, including flat-footedness (DeSilva et al., 2010; Henneberg et al., 2014), curved fingers and toes, nearly identical endocranial capacities (Falk et al., 2005; Kubo et al., 2013), nearly identical limb proportions (Jungers et al., 2016), nearly identical height (Jungers et al., 2016), broad pelvises with laterally flaring ilia (Stringer, 2014), non-projecting chins, and possibly more funnel- or bell-shaped thoraxes. The commonality of all these aberrant features makes sense if both belonged to small, genetically isolated pygmy human populations. Several of these reputed "*Australopithecus*-like" features are also found in *H. naledi* specimens from South Africa (Feuerriegel et al., 2017; Hawks et al., 2017), and to a lesser extent in pygmy humans from Palau, Micronesia (Berger et al., 2008). Apparently, the same suite of traits can arise independently in geographically separated populations, which suggests they are likely developed by similar processes. Perhaps parallel processes include genetic isolation, insular dwarfism, inbreeding, and fixation events associated with founder effects, just as evolutionary paleoanthropologists have proposed (Berger et al., 2008; Rupe and Sanford, 2019).

Further Evidence of a Post-Flood Pygmy Human Population in East Africa

A Small Adult Knee Joint (A.L. 129-1)

The Pygmy Human Hypothesis is further supported by the small A.L. 129-1 knee joint that was discovered by Johanson during his first International Afar Research Expedition, a year before he found Lucy, at an entirely separate locality. A high bicondylar angle (15°) is visually apparent in the A.L. 129-1 specimen (Figure 11A). The distal part of the femur preserves inferiorly flattened condyles that are elongated in lateral view (Lovejoy, 2007). This feature is both measurably and visually distinct from apes (Miller and DeSilva, 2023). Inferiorly flatted condyles are critical for increasing the contact surface in the knee joint for load dissipation in bipedal locomotion (Aiello and Dean, 1990; Miller and DeSilva, 2023). Apes have inferiorly rounded condyles, which is why they cannot stand upright in a

1 "Big Man" is a partial skeleton attributed to *Au. afarensis*, however, Rupe and Sanford (2019), among other creation scientists, argue that the skeletal morphology is distinctly human and should be reclassified as such.

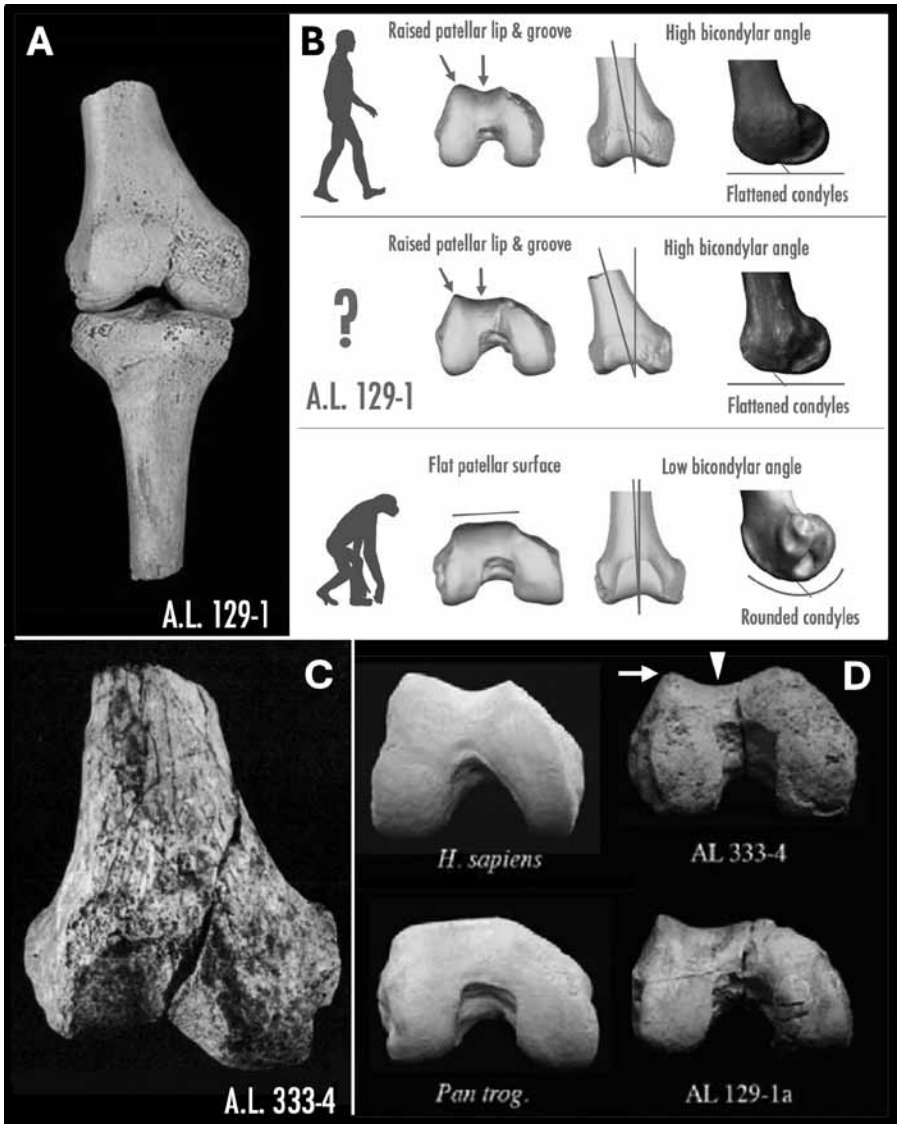

Figure 11. Features of the distal femur in australopithecines. (A) A.L. 129-1 knee joint exhibiting a high bicondylar angle. (B) Inferior and lateral views of femoral condyles in *H. sapiens* (top row), A.L. 129-1a (middle row), and chimpanzee (bottom row). (C) A.L. 333-4, a larger distal femur recovered from the "First Family" site displaying a high bicondylar angle. (D) Clockwise: Femoral condyles of *H. sapiens*, A.L. 333-4, A.L. 129-1a, and chimpanzee (*Pan trog.*). A.L. 333-4 reveals a raised patellar lip (arrow) and a deep patellar groove (arrowhead), as can be seen in A.L. 129-1a and *H. sapiens*. A and B adapted from: Miller and DeSilva (2023). C from: Lovejoy et al. (1982); and D from: Schwartz (2014).

restful, lock-kneed position. In addition, the patellar groove is deep, and there is a raised lateral patellar lip, which is typical of modern humans and necessary to prevent patellar dislocation when associated with a high bicondylar angle (Aiello and Dean, 1990; Miller and DeSilva, 2023) (Figure 11D). The presence of all these traits together in one knee joint—i.e., high bicondylar angle, raised lateral patellar lip, deep patellar groove, inferiorly flattened and laterally elongated condyles (Figure 11B)—is strong evidence for bipedality and modern human anatomy (Lovejoy, 2007). Johanson and Taieb (1976) recognized these distinctly human features in their earlier *Nature* paper (see also: Johanson, 1976) in which they originally reported their Hadar collection consisted of two separate genera, *Australopithecus* and *Homo*.

The complete fusion of growth plates further suggests the knee joint belonged to an adult human of small stature, nearly identical in size as Lucy's. Thus, we now have evidence of two small-bodied individuals having lived in the same general vicinity of the Hadar region. Lucy is one individual and the second is the owner of the isolated knee joint found at Afar Locality 129.

In this same Hadar Formation, a distal femur was recovered from the "First Family" site (A.L. 333-4) during the 1975 field season. It is very similar in terms of overall morphology to the A.L. 129-1a distal femur, though noticeably larger in size (Lague, 2002). The larger distal femur has all the same diagnostic bipedal human features as A.L. 129-1a (Figure 11C) (Lovejoy, 2007). In a study describing these small and large specimens (A.L. 129-1 and A.L. 333-4), Lovejoy (2007) concludes, it is "patently obvious from their distal femora alone that *A. afarensis* locomoted with complete knee extension" as in modern humans. Johanson and colleagues have attributed these small and large distal femora, as well as other homologous anatomical elements, to sexual dimorphism (Lague, 2002; Kimbel and Delezene, 2009; Johanson, 2017). However, if Lucy represents a small-bodied human, then these larger human-like bones suggest the presence of humans of "normal" stature living in the same region.

Small Adult Proximal Femora (A.L. 129-1c and A.L. 128-1)

Other findings further corroborate the presence of small-bodied humans during the time of the Hadar Formation in East Africa. In October of 1973, right and left proximal femur fragments (A.L. 129-1c and A.L. 128-1) were recovered near where the A.L. 129-1 knee joint was found (Johanson and Taieb, 1976). Johanson suspected they probably belonged to the owner of the A.L. 129-1 knee joint (Johanson and Edey, 1981). The fragments preserved the upper end of the femur yet lacked the heads. The left proximal femur (A.L. 128-1) was better preserved, with the shaft broken ~38.0 mm below the lesser trochanter (Johanson and Taieb, 1976). A cross-sectional view of the relevant part of the femoral neck provides information relating to load bearing during locomotion. The thick layer of cortical bone at the bottom of the neck is consistent with human bipedal locomotion; the ossification pattern is distinctly different from quadrupedal apes (Ohman et al., 1997; Lovejoy, 2005b). An X-ray image described by Lovejoy supports the human identity of the A.L. 128-1 femur (Figure 12):

> "X-rays show dramatic differences between the femur necks of a chimpanzee, on the left, and a modern human. The chimpanzee has a thick layer of dense bone that forms a bony ridge at the top. This design withstands the physical forces that a chimp encounters while climbing trees. The human design, with more spongy bone inside and a thick outer layer at the bottom, withstands the forces of two-legged walking. The Hadar fossils are almost identical to the human pattern." (Johanson et al., 1994)

Researchers reporting in an orthopedics research journal examined the ossification pattern seen in the A.L. 128-1 proximal femur, originally described by Lovejoy, and affirmed his assessment (Hogervorst et al., 2009). These human-like proximal femora (A.L. 128-1; A.L. 129-1c), together with the knee joint (A.L. 129-1), strengthen the position that pygmy humans lived during the time of the Hadar Formation in East Africa.

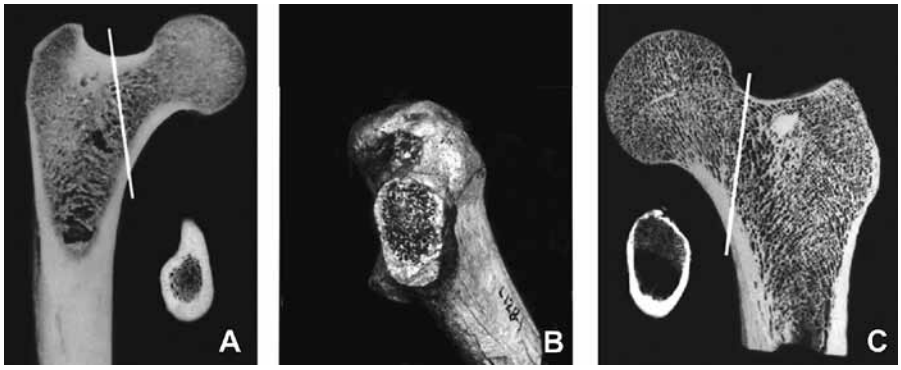

Figure 12. A comparison of the ossification pattern in the femoral necks of (A) chimpanzee; (B) *Au. afarensis*, A.L. 128-1; and (C) *H. sapiens*. The ossification pattern matches modern human femora. Images originally from: Lovejoy (2005b) and Ohman (1997); combined from: Hogervorst et al. (2009).

Extinct Ape or Human?

Non-Diagnostic Traits Complicate Creationist Taxonomic Assignments

Creationists have historically considered Lucy and her kind to be an extinct quadrupedal ape that belonged to the *Australopithecus* genus. These claims are largely based on traits that are assumed to be diagnostic of *Australopithecus* taxa, such as funnel-shaped thoraxes, laterally flaring ilia, curved phalanges, and cranially oriented glenoid cavities (discussed below). However, these traits are not exclusive to *Australopithecus*; they occur in true human fossils. Treating them as if they were diagnostic of an ape-like australopithecine has led to the potential misclassification of several hominin fossils that preserve similar features. These examples demonstrate why it is so important to identify key morphological features that can be used to distinguish extinct fossil apes and true *Australopithecus* fossils from humans. The Pygmy Human Hypothesis does not assume that all hominin fossils from the Hadar Formation are pygmy humans, but rather that there are two genera present, a smaller and larger *Homo* (e.g. A.L. 288-1 and KSD-VP-1/1) and the "true" *Australopithecus* (e.g., A.L. 444-2 and A.L. 822-1), which was an extinct ape similar to extant great ape species with a bent-hip, bent-knee posture (see FM orientations in Kimbel and Rak, 2010).

Claims made about certain fossils displaying distinctly human-like bipedal morphologies are a tell-tale sign that those fossils may not belong to *Australopithecus*, and careful reexamination is warranted. Once all the distinctly human fossils that were falsely attributed to *Australopithecus* are identified and reclassified as *Homo* (not arbitrarily, but on the basis of key morphological indicators), what remains are the fossils of extinct members of the Hominidae family. Determining the "key morphological indicators" to distinguish between *Homo* and "true" *Australopithecus* is not a trivial task and should consider the total range of morphological variation observed in both modern and ancient human remains.

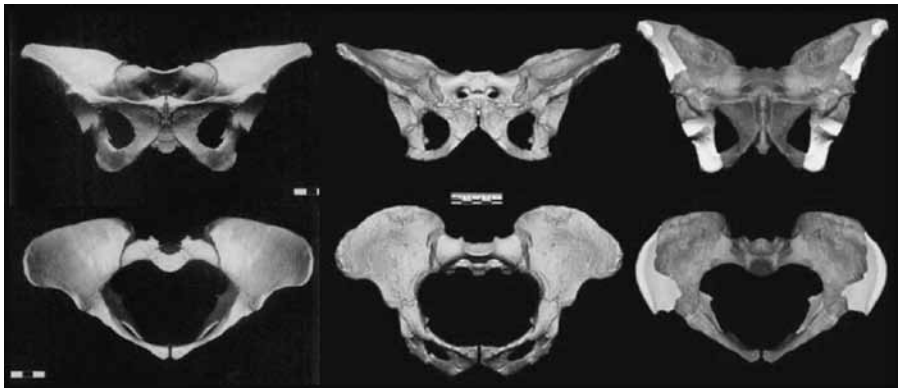

Figure 13. Examples of potentially misclassified human pelvises. Left to right: Lucy (A.L. 288-1); *Au. africanus* (STS 14); *Au. sediba* (MH 1/MH 2 composite). From: Schmid and Häusler (1995); STS 14 and MH 2 from: Kibii et al. (2011).

Funnel-Shaped Thoraxes Diagnostic of *Australopithecus*?

A funnel-shaped thorax is typically regarded by creationists as a diagnostic feature of *Australopithecus* taxa. This has led to the classification of *H. naledi* as *Australopithecus* partly on the basis of thorax shape (O'Micks, 2017). However, as noted above, humans have been shown to have funnel-shaped thoraxes (or more accurately, *barrel-shaped*), including *H. naledi* (Berger et al., 2015), Neanderthals (Tattersall, 2015), Turkana Boy (Hershkovitz et al., 2007), pathologic modern humans (Hershkovitz et al., 2007), and possibly the Hobbit (Hershkovitz, 2007; Latimer et al., 2016). Since this feature is not unique to *Australopithecus* and is found in humans, it should not be considered diagnostic of *Australopithecus* taxa.

Laterally Flaring Ilia Diagnostic of *Australopithecus*?

Lucy's laterally flaring ilia has also been used to argue she was an ape-like australopithecine (Clarey, 2018). However, several *Homo* pelvises, including Neanderthals (SH 1) (Arsuaga et al., 1999), *H. erectus* (BSN 49/P27) (Churchill and VanSickle, 2017), *H. floresiensis* (LB 1) (Henneberg et al., 2014), *H. naledi* (VanSickle et al., 2017), American Indian (Lovejoy et al., 1973), and pathologic modern humans (Hershkovitz et al., 2007) exhibit laterally flaring ilia (see Figure 5 above). Additional examples of hominin *Homo* pelvises with laterally flaring ilia have been documented (Rosenberg, 2017). Clearly, this feature is not exclusive to *Australopithecus.* It may even be argued that lateral iliac flare in humans is unique in that it is produced by sagittal rotation of the iliac blades, rather than by the flat, coronal-plane orientation typical of apes (Harrison, 1991). Consequently, *Australopithecus* pelvises with more sagittally oriented iliac flare may actually be misclassified human pelvises. Regardless, some creationists have considered this feature indicative of *Australopithecus* genera (Clarey, 2018; Tomkins, 2019). This perception has caused creationists to overlook the overall distinctly human form of these bowl-shaped pelvises.

The classification of Lucy's pelvis as *Australopithecus* has led to the potential misclassification of a series of other hominin pelvises that look similar to Lucy's—a "domino effect" if you will. Consequently, when this trait is found in other hominins such as *H. naledi* or *Au. africanus,* creationists may be inclined to conclude that those pelvises must therefore belong to *Australopithecus*. Indeed, some creationists have argued (at least in part) on the basis of flaring ilia that *H. naledi* was an australopithecine-human hodgepodge (Tomkins, 2019). This view is based on a study by VanSickle et al. (2017) who noted the degree of lateral flaring in the ilia of STS 14 (*Au. africanus*), and A.L. 288-1 (Lucy) is similar to that of *H. naledi.* Yet, it's possible that these three pelvises may share similarly flared ilia because all three are human in origin. For example, STS 14 closely resembles Lucy's, in terms of morphology and size (Johanson and Taieb, 1976). Interestingly, the co-discoverer, Robert Broom, compared the STS 14 pelvis to a pygmy human pelvis (Broom et al., 1950). He pointed out some differences in the pelvis compared to humans, yet acknowledged in terms of overall morphology it was "essentially like that of modern man." Indeed, it may therefore be another example of a misclassified human pelvis (Figure 13). Supporting this interpretation, the STS 14 pelvis was found with a human-shaped vertebral column with lumbar lordosis (Broom et al., 1950; Johanson and Edgar, 1996). This specimen was classified by paleoanthropologists as *Au. africanus* (it was considered "too old" to qualify as *Homo*), a taxonomic designation that creationists have uncritically accepted. In addition, as with Lucy, the auricular surface of the small sacrum of STS 14 articulates with the Hobbit's os coxae (Jungers et al., 2009), which is expected if both are small-bodied humans with human pelvises.

The iliac blades of *Au. sediba* are described as more derived compared to other australopiths, in that they are less flared and more vertically oriented, as in later *Homo* (Kibii et al., 2011). Perhaps, since the pelvises of *Au. sediba* are morphologically similar to

humans, they should be classified as *human* (Figure 13).

If, as proposed, these pelvises, which have been classified as *Australopithecus*, are actually human in origin, this undercuts the evolutionary narrative that the australopithecines, including Lucy, were obligate bipeds with human-like pelvises, yet with ape-like skulls—an "ideal" transitional form.

Curved Fingers and Toes Diagnostic of *Australopithecus*?

Curved fingers and toes are yet another feature that has led creationists to classify human fossils as *Australopithecus*, such as those who have argued *H. naledi* is an *Australopithecus* (Mitchell, 2015). Once again, curved fingers and toes should not be considered a diagnostic trait since they can occur in humans. For example, finger bones belonging to another small-bodied human were discovered in Callao Cave on the Philippine Island of Luzon (Détroit et al., 2019). The finger bone was found together with other undisputed human bones. Like the small-statured *H. naledi*, the finger bones of the pygmy from Luzon are curved (Figure 14).

The Flores "Hobbit" was also found to have curved fingers (and curved toes). The hand bones belonging to the individual LB 6 were described by Kivell (2015) as follows: "...although *H. floresiensis* has a broad pollical distal phalanx with a human-like FPL attachment, the proximal phalanges are curved to a similar degree as in *Au. afarensis*…" (Kivell, 2015). The author mentions the presence of a flexor longus pollicis (FLP) attachment at the base of the distal phalanx of the thumb. In humans, the FLP is a long muscle in the forearm that extends through the carpal tunnel as a tendon to where it attaches to the base of the thumb, which allows us to flex our thumb. Apes have a rudimentary or absent FPL muscle. The presence (or absence) of a well-developed attachment site is a more decisive taxonomic indicator than curved fingers alone. This feature is well-preserved in a thumb bone attributed to *Au. afarensis,* labeled A.L. 333-159. The researchers observe, "A distal pollical phalanx confirms the presence of a human-like flexor pollicis longus muscle in *A. afarensis*." (Ward et al., 2012). Thus, A.L. 333-159 may represent yet another example of a misclassified human bone, which would make sense since it was found from the same "First Family" site where all the other morphologically human hand bones (Johanson, 1976; Alba et al., 2003) and morphologically human foot bones were found (Johanson, 1976; Latimer and Lovejoy, 1990; Ward et al., 2011; DeSilva et al., 2020; Rupe, 2025). Again, this is the same fossil assemblage (site A.L. 333) that Johanson originally considered to be *Homo* (Johanson, 1976; Willis, 1992). Thus, just as the potentially misclassified pelvis of Lucy can create a "domino effect" of other "misclassified" pelvises, the same can happen with the composite human hand and human foot bones that were classified as *Au. afarensis*, especially when they are found in strata that allegedly date older than the genus *Homo,* such as the Hadar Formation in Ethiopia.

Figure 14. The upper profile of finger is curved like that of an ape, yet there can be no question it belonged to the small-bodied human, *H. luzonensis*. From: https://www.donsmaps.com/luzon.html.

Cranially Oriented Glenoid Cavities Diagnostic of *Australopithecus*?

Lucy preserves a small part of the scapula that articulates with the humerus to form the shoulder joint, known as the glenoid cavity. Paleoanthropologists study several scapular landmarks that may be used to infer the propensity for arboreal behavior. A more cranially orientated glenoid cavity is typically considered to be more ape-like, since it allows for habitual elevation of the arm, as would be used in climbing (Aiello and Dean, 1990).

The ventral/bar glenoid angle is one such feature commonly used to indicate arboreal behavior (Figure 15). Lower angles closer to 130° indicate a more cranially oriented glenoid cavity. Lucy's bar-glenoid angle measures 132.3°, compared to 134.0° in "Big Man" (KSD-VP-1/1), 137.6° in "Turkana Boy" (KNM-WT 15000), 131.6° in *Au. sediba* (MH 2), 142.3° in *H. sapiens*, 157° in the "Hobbit" (LB 6/4), 127.8° in chimps, and 130.6° in gorillas (Churchill et al., 2019). Note that the anatomical association of the MH 2 scapula with a morphologically human hand strongly suggests the scapula is also human.[2]

2 A fossil hand described as "hauntingly similar to that of modern humans" was attributed to *Au. sediba* (MH 2). It preserves a long relative thumb length diagnostic of human hands (Alba et al., 2003; Berger and Aronson, 2012). The distinctly human hand recovered from the limestone arm block "refits perfectly" with the scapular fragment block (Val, 2013), confirming both parts are human. Discussed in: Rupe and Sanford (2019), p. 185 and Fig. 6 on p. 188, revealing the human proportions of MH 2. See also: Rak et al. (2021), evolutionary paleoanthropologists who argue *Au. sediba* is a commixture of *Homo* and *Australopithecus* fossils.

Figure 15. Bar-glenoid scapular landmarks. From: Churchill et al. (2018).

Figure 16. The scapular fragment of A.L. 288-1 compared to an equally small-statured Amerindian's scapula with similar degree of preservation. From: Haile-Selassie et al. (2010).

A low bar-glenoid angle has been used to argue that Lucy had a more ape-like orientation of the glenoid cavity (Aiello and Dean, 1990). Even so, the bar-glenoid angle in *Au. sediba* (MH 2) is nearly the same as Lucy's; Big Man's is also close to Lucy's, which is consistent with the perspective that all three are human scapulae. Lovejoy has noted Big Man's scapula "differs very little from a modern human scapula, save the fact that its glenoid cavity (to which the humerus articulates) is slightly more angulated upward…" (Lovejoy, 2014). If Big Man's scapula is human, as the rest of the skeleton suggests (Haile-Selassie et al., 2010; Lovejoy, 2014; Ward, 2016), it logically follows that humans can have low bar-glenoid angles, too. Yet, that doesn't mean those scapulae belong to apes. In describing the bar-glenoid angle in Lucy, Haile-Selassie et al. (2010) make a fascinating observation relating to supposed scaling effects when they compared it to a small-statured human scapula:

> "The "bar–glenoid" angle has been used to orient the glenoid plane in A.L. 288–1 (29), but the specimen's small size may have had scaling effects (30, 31), an observation supported by the fact that its bar–glenoid angle can be matched exactly by comparably sized humans (SI Appendix, Fig. S21)."

These researchers are both surprised and puzzled by the small-statured American Indian's bar-glenoid angle, which perfectly matches Lucy's in her corresponding scapula fragment (Figure 16). Haile-Selassie et al. (2010) describe the striking similarity in the supplementary information of their published paper, stating: "The specimens from opposite sides have been aligned based on the orientation of their glenoid planes. Note the virtual identity of their bar-glenoid angles."

All things considered, there can be a broad range in bar-glenoid angles (and glenoid-axillary angles) in humans. Indeed, researchers have found that among smaller-sized scapulae, the bar-glenoid angle in arboreal species and humans overlaps:

> "We have found that the data scatters for the African apes and humans converge at the smaller size ranges, and Lucy's value for bar-glenoid angle is not tightly correlated with function and, as such, cannot be used as a morphological signal for arboreal behavior, especially in the smaller size ranges at which arboreal and nonarboreal species overlap" (Inouye and Shea, 1997).

The important question to consider is whether a more cranially oriented glenoid cavity can be considered a diagnostic taxonomic indicator, especially since lower angles are measured in human scapulae, such as Big Man, MH 2 (classified as *Au. sediba*), small-statured American Indian, *H. naledi*, and *H. erectus* specimens from Dmanisi, Georgia. When describing an adult scapula from Dmanisi, Lordkipanidze et al. (2007) observe: "The glenoid cav-

ity [D4166] is more cranially oriented relative to the midaxillary border than in modern humans, and thus closer to the condition found in australopiths (Sts7 and AL288-1) and African apes."

Likewise, Feuerriegel et al. (2019) describe the glenoid cavity of a partial scapula from a small-bodied human from the Dinaledi Chamber as markedly cranially oriented:

> "The Dinaledi Chamber preserves one partial scapula, U.W. 101-1301, with bar-glenoid and axillary border/spine angles indicative of a markedly cranially-oriented glenoid fossa and very oblique scapular spine, respectively (Feuerriegel et al., 2017). This scapula configuration is similar to what is seen in *Hylobates* and *Pan*, and is inferred to reflect the habitually overhead posture of the arm in suspensory apes to assist with efficient arm elevation."

In an earlier paper, Feuerriegel et al. (2016) describe the shoulder girdle configuration of *H. naledi* as "more similar to that of *Australopithecus* and distinct from that of modern humans." It is clear from these findings that a "markedly" cranially-oriented glenoid occurs in human fossils—therefore, it should not be considered a diagnostic trait.

In summary, several traits have been used to argue that Lucy and other Hadar fossils from separate localities belong to *Au. afarensis*. Those traits include funnel-shaped (or bell-shaped) thoraxes, laterally flaring ilia, curved phalanges, long arms relative to femur length, small cranial capacity, and cranially oriented glenoid cavities. However, those traits should not be considered diagnostic of australopithecines since they have been shown to occur in human fossils.

This paper proposes that there are more reliable traits that can be used to distinguish human fossils from the true ape-like *Australopithecus* genus. Some of those features include: the overall morphology of the pelvis (discussed above); a high bicondylar angle in combination with a suite of features seen in femoral condyles (discussed above); long relative thumb length and a well-developed flexor longus pollicis attachment site at the base of the thumb (discussed above); a talocrural joint that is perpendicular to the tibia (discussed above); a rigid mid foot; transverse and longitudinal arches, and an adducted hallux, to name a few.

Conclusion

Lucy was an unprecedented find for the evolutionary paleoanthropology community. For the past 50 years of paleoanthropology investigations, Lucy has remained one of the best-preserved fossil hominins for her presumed age. Therefore, whenever new fossils are found, the corresponding elements are always compared to Lucy's. This sets the stage for a serious error if Lucy was misclassified. If Lucy's skeleton is human and it preserves key diagnostic features indicating obligate bipedalism, as in humans, yet it was misclassified as an *Australopithecus* species, all subsequent fossil discoveries that preserve similar features would be impacted.

The impact would be devastating, leading to the systematic misclassification of many fossils. If Lucy is actually a small-bodied human, then this is precisely what has happened in the field of paleoanthropology, and it has directly impacted the creation movement by creating a lot of confusion. We have unwittingly participated in the ongoing practice of misclassifying true human bones as *Australopithecus.* For example, creationists who classify Lucy's pelvis as *Australopithecus* will tend to classify other hominin pelvises that resemble Lucy's—such as *Au. africanus* (STS 14), *Au. sediba* (MH 1/MH 2), and *H. naledi*—as *Australopithecus,* even though they are all morphologically human (Figure 13). This not only creates confusion, but it also reinforces the evolutionary claim that the australopithecines exhibited human-looking postcranial anatomies that are well-suited for bipedal locomotion, making their "missing link" claims appear more credible to the general public.

Generally speaking, there are two different perspectives in the creation community. The proponents of the "Quadrupedal Ape Hypothesis" include those who insist Lucy and her kind were an extinct, knuckle-walking quadrupedal ape. This view generally accepts the *Australopithecus* taxonomic designation of Lucy and her kind, but in order to maintain their chimp-like interpretation, they downplay the bipedal features and argue that those bones belonged to quadrupedal apes. This position is easily challenged by informed evolutionists because those fossils, such as Lucy's pelvis, really do show bipedal morphologies.

In the more obvious cases of mistaken identities, the "Quadrupedal Ape Hypothesis" proponents have correctly pointed out the true human identity of fossils attributed to *Au. afarensis,* such as the "Big Man" skeleton (Line, 2010) or the fourth metatarsal found at the "First Family" site (Werner, 2007; Thomas, 2011). Yet, in other cases, non-diagnostic traits (i.e., curved fingers and toes, funnel-shaped thoraxes, laterally flaring ilia, cranially oriented glenoid cavity, small cranial capacity, etc.) and false allegations about Lucy's pelvis reconstruction being fraudulent, have led proponents of the Quadrupedal Ape Hypothesis to overlook the potentially human status of Lucy, as well as several other "misclassified" bones attributed to her kind.

The second perspective, the "Bipedal Ape Hypothesis," recognizes the bipedal traits seen in Lucy and the broader genus of *Australopithecus*. However, rather than interpreting

those as human features, proponents of this hypothesis view *Au. afarensis* as a hominin species with obligate bipedal locomotion, a human-like postcranial skeleton, and distinctly ape-like skulls. In essence, they have no bones to pick with the popular museum displays of Lucy.

This paper proposes a different stance, the "Pygmy Human Hypothesis." The "Bipedal Ape Hypothesis" proponents are correct to insist Lucy's skeleton preserves human-like bipedal anatomies; however, the "Pygmy Human Hypothesis" takes this one step further—Lucy's skeleton preserves human-like bipedal anatomies *because she is human*.

The approach presented in this paper is highly reliant on identifying key morphological features that are exclusively human. For instance, rather than trying to dismiss clear bipedal anatomies, this approach uses these skeletal features as some of the best indicators to identify true human bones. A compelling case can be made that the hypodigm of *Au. afarensis* from 3-4 million years ago (according to conventional age assignments), as well as the *Australopithecus* genus more broadly, includes true human bones that were misclassified—far more than has been previously recognized. Lucy is just one of many. This supports the Biblical model of coexistence of *Homo* and *Australopithecus* far deeper into the hominin fossil record and presents major challenges to the prevailing ape-to-man evolutionary model.

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Unshaken Foundations: Reclaiming Earth's History Through Scripture, Science, and the Coherence of Faith—

Theological Foundations of Young-Earth Creationism

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Key Words: Biblical Genealogies, Creation Days, Doctrinal Integrity, Scriptural Authority, Young-Earth Chronology

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Abstract

This first paper in a series exploring young-Earth creationism (YEC) examines its theological foundations and Biblical rationale, laying the groundwork for a broader, interdisciplinary analysis. Grounded in a literal interpretation of Genesis, it focuses on key scriptural evidence, including genealogies and Earth's chronology, that support an Earth age of approximately 6,000 years. This work also addresses theological challenges posed by old-Earth interpretations and highlights their implications for fundamental doctrines, such as the coherence of Christ's redemptive work. By reaffirming the authority of Scripture, this study establishes the Biblical cornerstone for subsequent explorations into scientific and philosophical dimensions of YEC.

Simple Summary

This article, the first in a series exploring Young-Earth Creationism (YEC), outlines the theological reasons for believing the Earth is only about 6,000 years old, arguing that this view is supported by a literal interpretation of the Bible's authority. The approximate 6,000-year age is calculated by carefully analyzing the specific chronological details and genealogies found in Genesis 5 and Genesis 11, which track human lineage from Adam. A key focus is on the meaning of the Hebrew word *yôm* (day) in Genesis 1, which YEC proponents argue should be understood as a literal, ordinary 24-hour period because it is consistently paired with the phrases "evening and morning" and ordinal numbers. Furthermore, the paper maintains that Genesis 1 is written as a historical narrative, not poetry or allegory, reinforcing the need for a plain reading of the text. The study challenges old-Earth interpretations, like the Day-Age Theory, stating that these models raise theological difficulties by suggesting that death and suffering existed for millions of years before Adam's sin, thus undermining foundational Christian doctrines about the Fall and Christ's redemptive work. Ultimately, this work reaffirms Scripture as the ultimate guide for interpreting Earth's history, serving as the necessary Biblical foundation for future papers that will examine the scientific and philosophical aspects of YEC.

Setting the Stage

The question of the Earth's age and the nature of creation has long stood at the intersection of theology, science, and Biblical scholarship. While salvation remains the cornerstone of Christian faith, the debate over Earth's timeline carries profound implications for Biblical interpretation, doctrinal integrity, and the dialogue between faith-based perspectives and secular paradigms. Central to this discourse is a critical

question: Should Scripture conform to prevailing human theories, or must Scripture itself guide our understanding of the natural world?

Young-Earth Creationism (YEC), rooted in the traditional and conservative exegesis of Scripture, asserts an Earth age of approximately 6,000 years, derived from genealogies and Biblical chronology. This perspective stands in tension with the scientific consensus favoring Earth's ancient origins. Yet, YEC does not rely solely on theology; it draws from a growing body of evidence to present itself as a scientifically viable framework that harmonizes with Biblical timelines. Far from being a simplistic or pseudoscientific position, YEC offers a coherent worldview supported by a literal interpretation of Genesis and a commitment to scriptural authority.

As the esteemed preacher Charles Spurgeon once remarked, "We are told that the world has existed for millions of years; we care very little for the guesses of science, but we do care for the teaching of Christ" (Spurgeon, 1886). Spurgeon's adherence to the primacy of Scripture reflects the enduring perspective of YEC: that Biblical truth must remain the lens through which we interpret competing theories of Earth's history. For many believers, YEC offers theological coherence while providing a scientifically informed view that aligns with their faith.

This paper serves as the Biblical cornerstone for a series dedicated to exploring YEC. By establishing the Biblical and theological foundations of YEC through a literal interpretation of Genesis, this work aims to reaffirm the authority of Scripture as the ultimate framework for understanding Earth's history. This foundational study prepares the stage for subsequent papers that will address scientific and philosophical dimensions, creating an integrated defense of YEC within the dialogue of faith and reason.

YEC continues to face robust challenges from scientific disciplines that endorse a much older Earth and universe. However, its proponents actively engage with these critiques, drawing upon rigorous methodologies to reconcile their views with contemporary findings. YEC emphasizes that when scientific evidence is interpreted through a Biblical lens, it reveals compelling support for a young Earth. This approach challenges the notion that faith and science are inherently incompatible, instead demonstrating their coexistence within a scripturally rooted worldview.

This paper reaffirms the authority of Scripture by advocating for a young-Earth perspective, firmly grounded in a literal reading of Genesis. Through an examination of Biblical genealogies, the creation account, and the narrative of the global Flood, it addresses the theological and logical difficulties inherent in old-Earth interpretations. By exploring how such perspectives influence foundational Christian doctrines—including the origin of sin, the nature of death, and Christ's redemptive work—this study underscores the centrality of Scripture in shaping a coherent Christian worldview.

Ultimately, this paper (as well as the papers in this series) consolidates key YEC arguments into an interconnected discussion. While evidence supporting a young-Earth perspective is often scattered across various texts, papers, and studies, this synthesis seeks to unify these threads into a single, accessible resource. In doing so, it aims to strengthen the coherence of YEC while resisting the secular paradigms that frequently challenge the authority of Scripture.

Biblical Genealogies and Earth's Chronology

Throughout history, humankind has sought to understand its origins—where we came from, how we got here, and how long this journey has unfolded. For Christians, the Bible offers not just spiritual guidance but also a historical framework that answers some of these profound questions. Among these is the age of the Earth, which can be explored through a careful analysis of Scripture.

One of the most influential figures in these calculations was Archbishop James Ussher, a 17th-century Irish theologian, who meticulously analyzed the genealogies in Genesis and integrated historical records, such as the reigns of ancient monarchs, to determine a precise timeline for the Earth's history. Ussher's chronology famously placed the creation of the Earth on the evening before October 23, 4004 BC. His work, published in *Annals of the World*, became a cornerstone for those seeking to align Biblical accounts with historical chronology (Ussher, 1658). Ussher's approach was not arbitrary; it reflected a comprehensive and systematic methodology, one that set a precedent for future scholars who sought to harmonize Scripture with historical records (Barrick, 2008).

The age of the Earth, from a Biblical perspective, can be determined through a detailed analysis of scriptural evidence, particularly the genealogies presented in Genesis 5 and Genesis 11. These genealogies trace the lineage of humanity from Adam through key figures such as Noah and Abraham (Barrick, 2008). Genesis 5:3 specifies that Adam was 130 years old when he fathered Seth, and this level of specificity is consistent throughout these chapters, which detail not only the ages of the patriarchs at the birth of their offspring but also their total lifespans (Barrick, 2008). By summing these ages, theologians calculate that approximately 2,000 years passed between Adam and Abraham. Further analysis of Biblical texts and historical context indicates that an additional

2,000 years elapsed between Abraham and Jesus. With roughly 2,000 years having passed since Jesus' time on Earth, the Biblical chronology situates the Earth's age at approximately 6,000 years (Whitcomb and Morris, 1961).

The detailed genealogies in Genesis reinforce this estimation and provide a compelling framework for understanding Earth's chronology. For example, in Genesis 5, the Scripture explicitly states, "Adam lived 130 years and begot a son in his own likeness, after his image, and named him Seth" (Genesis 5:3). Similar records continue with figures such as Methuselah, who, according to Genesis 5:27, lived to be 969 years old—the longest recorded lifespan in the Bible. These genealogical accounts were not written as vague allegories, but as precise historical records intended to be taken seriously by their readers (Barrick, 2008).

The specificity of these genealogical records—detailing the exact ages at which individuals fathered children and their total lifespans—sets them apart from symbolic or allegorical writings (Snelling, 2014). Unlike allegories, which typically rely on abstract or figurative language to convey moral or philosophical truths, these passages present numerical details with meticulous precision, indicating their purpose as historical documentation. Phrases such as "Adam lived 130 years" or "Seth lived 105 years and begot Enosh" (Genesis 5:6) clearly reflect an intent to provide a chronological framework.

Moreover, the genealogies are central to the Bible's broader historical narrative, particularly in the genealogy of Jesus Christ presented in the New Testament (Matthew 1:1–17, Luke 3:23–38). These genealogical records directly build upon the Old Testament lineages, linking the patriarchs to the fulfillment of messianic prophecy (Barrick, 2008). Were the genealogies to be understood merely as allegories, the continuity of Scripture and the fulfillment of God's promises through Christ would be undermined, weakening key Christian doctrines (Whitcomb and Morris, 1961).

Throughout history, Christian scholars have relied on these genealogies to explore and affirm the Bible's historical narrative. Julius Africanus, a third-century Christian historian, used the Septuagint—a Greek translation of the Old Testament—to calculate the age of the Earth. Although the figures in the Septuagint differ slightly from those in the Masoretic Text (the Hebrew version of the Old Testament), their overall conclusions remain consistent, placing the creation of the Earth approximately 4,000 to 5,500 years BC (Africanus, 221; Barrick, 2008). These figures have also been corroborated by other early Christian historians, such as Eusebius, who further emphasized the importance of integrating genealogical records with historical events to form a cohesive Biblical timeline.

Additionally, the genealogies in Genesis serve a practical and theological purpose that further justifies their interpretation as historical accounts (Ham, 1987). They provide an ancestral record that traces the continuity of God's covenant with His people, forming a direct line from Adam to Noah and onward to Abraham, whose descendants were chosen to carry forward God's promises (Snelling, 2014). This unbroken lineage not only connects humanity's origins to its ultimate redemption through Jesus Christ but also affirms the authority of Scripture as a reliable historical document.

While modern scientific claims often challenge the idea of a young Earth, these Biblical genealogies offer an internally consistent framework for understanding human history and Earth's timeline. Despite differences in interpretation between Christian traditions—such as variations between the Masoretic Text and the Septuagint—the overarching conclusion remains: the Biblical narrative supports an Earth that is thousands, not millions or billions, of years old (Jones, 2005). These genealogical records, far from being relics of an ancient worldview, remain central to the Christian understanding of history, theology, and faith.

Septuagint and Its Provenance

The Septuagint (LXX)—a Greek translation of Hebrew scripture completed in the third century BC—offers valuable insight into textual transmission and Biblical interpretation. While often debated regarding its alignment with the Masoretic Text, the Septuagint holds a unique position in the history of Biblical scholarship. For YEC advocates, the Septuagint is a vital resource, as its genealogical data offers evidence consistent with the young-Earth framework. However, as highlighted in Michael Lamb's 2019 research, the Septuagint's textual reliability is challenged by its instances of extensive messianic prophecy corruptions and Flood-related chronology errors. Lamb argues that such issues disqualify the Septuagint as a reliable source for creationist research, emphasizing that its genealogical variations cannot be fully reconciled with the Biblical framework (Lamb, 2019).

Despite these concerns, the Septuagint remains an important text for understanding the theological and historical development of Biblical chronology. One of the key points of divergence between the Septuagint and the Masoretic Text lies in their genealogical ages, particularly in the early chapters of Genesis. The Septuagint often lists higher-age figures for the patriarchs at the time they fathered children, resulting in a longer chronological timeline between Adam and Abraham compared to the Masoretic Text. For instance, the age discrepancies between these texts yield a dif-

ference of approximately 1,400 years. This raises critical questions about the precise chronology of Biblical events. While these variations still affirm an Earth that is thousands of years old, Lamb's findings suggest that reliance on the Septuagint's data might obscure rather than clarify the young-Earth framework, particularly in light of its textual inconsistencies (Barrick, 2008; Lamb, 2019).

The Septuagint's provenance and purpose further enhance its relevance to YEC. Dr. Pieter Lalleman highlights its widespread use among early Christians, including the New Testament authors, who frequently quoted from it. This affirms the Septuagint's theological authority in shaping early Christian thought and its compatibility with the core tenets of Biblical doctrine. Early Christian historians such as Julius Africanus relied heavily on the Septuagint for their genealogical calculations, using it to argue for a coherent Biblical chronology (Africanus, 221; Lalleman, 2015). Likewise, Eusebius of Caesarea adopted the Septuagint's genealogical data in his seminal *Chronicon*, reinforcing its historical significance in establishing a timeline that aligns with YEC perspectives (Eusebius, 325).

Timothy Michael Law underscores the Septuagint's role in bridging the Hebrew scriptures with the Greek-speaking world, thus preserving the integrity of God's word across linguistic and cultural boundaries. This cross-cultural translation effort ensured that the theological truths of Scripture, including the creation account and genealogical records, remained accessible to the growing Christian community (Law, 2013). While some may view the variations between the Septuagint and Masoretic Text as problematic, they also demonstrate the meticulous nature of Biblical transmission and the divine providence guiding its preservation. Despite textual challenges, the Septuagint's use by early Christians and its role in Biblical scholarship affirm its theological significance.

Furthermore, the theological implications of the Septuagint's translation process affirm the coherence of a young-Earth chronology within the broader framework of Scripture. By using genealogical records, the Septuagint upholds the integrity of key doctrinal concepts, such as the historical reality of Adam as the first man and the centrality of humanity's origin in God's creative work. Early Christian theologians, including Clement of Alexandria, cited the Septuagint's chronology to argue for a unified Biblical timeline, emphasizing its consistency with the Genesis narrative and its role in affirming the young-Earth view (Clement of Alexandria, 190; Africanus, 221).

While critics often point to differences between the Septuagint and Masoretic Text as evidence of textual inconsistency, YEC proponents highlight that both texts ultimately point to a shared timeline that supports a young Earth. The genealogical data in the Septuagint provides additional layers of clarity for calculating the age of the Earth while preserving the theological significance of the Genesis account. The LXX thus serves not only as a historical artifact but also as a critical piece of evidence in reaffirming the authority and reliability of Scripture.

The Septuagint's genealogies, when viewed through the lens of a young-Earth framework, further underscore the consistency of Biblical chronology. Its role in shaping early Christian thought and its compatibility with foundational doctrines make it a cornerstone in defending the theological coherence of YEC. By preserving the integrity of Genesis and its timeline, the Septuagint contributes to a holistic understanding of Earth's history, centered on the authority of God's word.

The paper *A Quantitative Analysis of the Life Spans of the Genesis Patriarchs* (Archer, 2012) provides insights into the life spans recorded in Genesis, emphasizing the theological coherence of the Septuagint's genealogical data. Archer argues that these records align with a timeline consistent with YEC, addressing discrepancies between the Septuagint and Masoretic Text while underscoring the reliability of both texts.

Challenges Posed by Old-Earth Interpretations

While the genealogies provide a robust framework for understanding Earth's age, they also highlight significant theological and doctrinal tensions posed by old-Earth interpretations. These alternative views attempt to reconcile Scripture with secular theories, yet they raise profound challenges that extend beyond science, impacting foundational Christian doctrines such as the Fall and redemption.

As humankind has grappled with questions about the origin and age of the Earth, perspectives have shifted significantly (Ham, 1987). For centuries, the Biblical account provided the primary framework for understanding the natural world and humanity's place within it (Mortenson, 2004). This view held sway not only within religious circles but also in broader intellectual discourse, with scholars relying on Scripture as a foundational source for knowledge about creation. However, during the late 18th and early 19th centuries, a paradigm shift began to take hold. Advances in geology, paleontology, and astronomy led to the emergence of scientific theories proposing that the Earth's age extended to millions or even billions of years—an interpretation fundamentally at odds with the traditional Biblical timeline (Mortenson, 2004; Snelling, 2014).

Key figures such as James Hutton, often referred to as the "father of modern geology" (Hutton, 1788), and

Charles Lyell introduced revolutionary concepts like uniformitarianism. This principle posited that geological processes observed today—such as sedimentation and erosion—had operated uniformly over vast periods of time, challenging the longstanding notion of a young Earth shaped primarily by catastrophic events like the Biblical Flood. These ideas, popularized through works like Lyell's *Principles of Geology* (Lyell, 1830–1833), gained significant traction and laid the foundation for a scientific consensus around deep time (Mortenson, 2004).

Simultaneously, discoveries in paleontology, such as the fossilized remains of extinct species, further reinforced the notion of an ancient Earth. Fossil stratigraphy suggested a sequential order of life-forms appearing and disappearing over time, leading to the belief in a progressive development of life across epochs (Whitcomb and Morris, 1961). These findings introduced a direct challenge to the Biblical narrative of creation and the timeline derived from genealogies in Genesis. Additionally, emerging theories in astronomy, such as Immanuel Kant's and Pierre-Simon Laplace's nebular hypothesis, proposed that the Solar System formed over millions of years through natural processes, further shifting perceptions of the universe's age (Mortenson, 2004).

In response to the paradigm shift introduced by radiometric dating and uniformitarianism, YEC proponents have sought to critically examine the assumptions underlying these methods. The *CRSQ* paper titled "Extensive Messianic Prophecy Corruptions and Flood-Related Chronology Errors Disqualify the Septuagint (LXX) as a Reliable Source for Creationist Research" (Lamb, 2019) highlights inconsistencies in the assumptions underlying radiometric dating methods, suggesting that accelerated nuclear decay during the global Flood could account for observed isotopic ratios. These findings not only challenge the validity of secular dating methods but also underscore the compatibility of geological evidence with the Biblical account, reinforcing the theological coherence of a young-Earth view.

In response to these developments, Christian theologians and scientists were faced with the task of reconciling their faith with these scientific claims. Various interpretative approaches arose, each seeking to harmonize the Biblical account of creation with an old-Earth framework. One prominent model, the Gap Theory, suggests a temporal gap between Genesis 1:1, "In the beginning God created the heavens and the earth," and Genesis 1:2, "The earth was without form, and void; and darkness was on the face of the deep. And the Spirit of God was hovering over the face of the waters." This gap purportedly allows for the passage of millions or billions of years, accommodating scientific evidence for an ancient Earth while maintaining the integrity of the six-day creation narrative beginning in Genesis 1:3. Advocates of this theory, such as Thomas Chalmers in the early 19th century, argued that the gap could also explain geological phenomena like fossils and sedimentary layers without contradicting Scripture (Chalmers, 1814; Mortenson, 2004).

Another influential interpretation, the Day-Age Theory, emerged as a means to align the Genesis creation account with scientific timelines. Proponents argue that the Hebrew word *yôm* (day) in Genesis 1, while often used to denote a 24-hour period, can also signify an indefinite span of time (Ross, 2017). This interpretation suggests that each creation "day" represents a long epoch, potentially spanning millions of years. Supporters often cite passages such as Psalm 90:4 (NIV) ("A thousand years in your sight are like a day that has just gone by") and 2 Peter 3:8, "But, beloved, do not forget this one thing, that with the Lord one day is as a thousand years, and a thousand years as one day," which echo this sentiment, as evidence that *yôm* need not always denote a literal day. However, critics emphasize that Genesis 1 consistently pairs *yôm* with the phrases "evening and morning," reinforcing its interpretation as a literal 24-hour period within the creation narrative (McGee, 2019).

More radical departures from traditional interpretations have gone further, rejecting Genesis 1–11 as a historical narrative altogether. These views, influenced by evolutionary theory, propose that these chapters are mythological or allegorical in nature, intended to convey theological truths rather than historical events (Walton, 2009). Under such frameworks, the Bible's historical timeline begins with Genesis 12 and the story of Abraham. This approach introduces theological challenges, particularly with regard to the origins of sin, the reality of death, and the necessity of Christ's redemptive work. If Genesis 1–11 is viewed merely as allegory, key elements of Christian doctrine—such as the introduction of sin through Adam—risk being undermined (Collins, 2011).

Furthermore, the reinterpretation of the Genesis Flood narrative also plays a significant role in this discussion. The concept of an ancient Earth requires reconsideration of the global Flood described in Genesis 6–9. A literal interpretation of the Flood implies a catastrophic event that would have dramatically altered the Earth's geological landscape, erasing sedimentary layers and fossils accumulated over billions of years. Old-Earth frameworks often recast the Flood as a localized event rather than a global one, creating tension with the Biblical text, which describes the waters covering "all the high mountains under the entire heavens" (Genesis 7:19, NIV) (Ham, 1987).

In the midst of these interpretative debates, Jesus' words in Mark 10:6

offer significant insight: "But from the beginning of creation, God made them male and female." This statement aligns with the traditional Biblical timeline, in which humanity was created at the beginning of Creation Week, rather than appearing millions or billions of years later, as proposed by evolutionary theory. Jesus' reference to creation underscores the importance of viewing Genesis not merely as symbolic but as an account with historical and theological weight (Collins, 2011).

Efforts to reconcile Scripture with scientific claims, though often well-intentioned, highlight the complexities of this debate. While approaches like the Gap Theory and Day-Age Theory attempt to bridge the gap between Scripture and science, they frequently raise additional theological and hermeneutical challenges. Galatians 6:1 ("Brethren, if a man is overtaken in any trespass, you who are spiritual restore such a one in a spirit of gentleness, considering yourself lest you also be tempted") reminds Christians to engage with such differing perspectives in a spirit of gentleness and humility, fostering dialogue while upholding the authority of Scripture.

The question of how to interpret the creation days described in Genesis lies at the heart of this debate. Central to this discussion is the Hebrew term *yôm*, which holds pivotal significance for understanding the timeline of creation and addressing the challenges posed by old-Earth interpretations.

The Nature of Creation Days: *Yôm* in Context

This section examines the grammatical and contextual interpretation of *yôm* in Genesis 1, emphasizing repeated phrases like "evening and morning" and the pairing with ordinal numbers as definitive markers of ordinary, 24-hour days. It highlights the application of the literal-grammatical-historical hermeneutical method, which demonstrates how the historical narrative of Genesis 1 affirms a literal interpretation of the creation days. Additionally, it addresses objections to this view, such as poetic readings, scientific reinterpretations, and alternative models like the "Day-Age Theory," focusing on the theological implications of maintaining a literal understanding.

At the core of the debate over Earth's age is the meaning of the Hebrew term *yôm* in Genesis 1. Whether *yôm* refers to literal 24-hour days or extended epochs is pivotal to the theological coherence of YEC and its defense against competing interpretations. For centuries, this term has been central to discussions of the Genesis creation account—whether it describes six ordinary days or represents longer ages (Ham, 1987; Barrick, 2008). As scientific models favoring an ancient Earth gained prominence, challenges to the traditional understanding of *yôm* became widespread, sparking diverse interpretations among Christian scholars and theologians (Walton, 2009).

The interpretation of the Hebrew term *yôm* as a literal 24-hour period remains a central debate in understanding Genesis. Norman Geisler, in his *Systematic Theology*, acknowledges that *yôm* most often refers to a standard day. However, he argues that this does not necessarily apply to Genesis 1, offering several reasons to suggest the creation days might not correspond to literal 24-hour periods (Geisler, 2002). Despite this, the text consistently states, "So the evening and the morning were the first day," (the Hebrew text in Genesis 1:5 literally says, "Day One,") and so forth, which strongly supports the interpretation of standard, 24-hour days (Ham, 1987).

This focus on the repeated phrases "evening and morning" forms the foundation of YECs interpretative approach. YECs employ a literal-grammatical-historical hermeneutic to interpret Scripture, particularly Genesis 1 (Barrick, 2008). This approach seeks to understand the text in its plain and straightforward meaning as it would have been understood by its original audience. As described in Article XV of the Chicago Statement on Biblical Hermeneutics (International Council on Biblical Inerrancy, 1982), this method emphasizes the importance of interpreting Scripture in its historical and cultural context, while recognizing the grammatical structure and literary genre of the text. It affirms that the meaning expressed in each Biblical passage is single, definite, and fixed, rejecting interpretations that obscure or distort the clarity of Scripture.

In the context of Genesis 1, the literal-grammatical-historical approach highlights the repeated pairing of "evening and morning" with each *yôm* as a clear marker of ordinary, 24-hour days. This interpretation aligns with the passage's presentation as historical narrative rather than poetry or allegory. Reinterpreting the text to incorporate external theories—such as millions of years—compromises its natural reading and obscures its clarity (Mortenson, 2004). By adhering to this hermeneutic, YEC proponents uphold the authority of Scripture, ensuring that its meaning is derived from the text itself rather than imposed by external assumptions.

The contextual use of *yôm* throughout scripture underscores the importance of deriving meaning directly from the text. As with any term, the meaning of *yôm* is determined by its surrounding context. This principle is especially significant given that *yôm* appears over 2,300 times in the Old Testament, and its meaning is rarely debated outside of Genesis 1 (Sarfati, 2015). For instance, no one questions whether the Israelites marched around Jericho for seven literal days or whether Jonah spent three actual days in the belly of the great fish (Walton, 2009).

However, in Genesis 1, the meaning of *yôm* is frequently reexamined to align with alternative interpretations. These reinterpretations often rely on external influences, such as geological or cosmological claims, rather than deriving their conclusions solely from the text itself.

Some argue that *yôm* in Genesis can signify more than a literal day. For example, Genesis 2:4, "This is the history of the heavens and the earth when they were created, in the day that the Lord God made the earth and the heavens," refers to the entire six days of creation as "the day when all things were created." This usage is similar to colloquial expressions like "back in the day," which refer to an extended period. However, Genesis 1 consistently pairs *yôm* with the phrases "evening and morning," clearly defining it as a normal 24-hour day (Snelling, 2014). This literal understanding is supported by the grammatical structure of the text, where *yôm* is paired with the cardinal number "one," a combination that uniformly denotes a standard day elsewhere in Scripture (Geisler, 2002).

Further reinforcement of this interpretation comes from Exodus 20:9–10, where God, during the giving of the Ten Commandments, commands the Israelites: "Six days you shall labor and do all your work, but the seventh day is the Sabbath of the Lord your God." This instruction directly parallels God's own Creation Week. The explicit comparison between the Israelites' six-day workweek and God's six-day creation period underscores the ordinary nature of these days. Exodus 20:11 further clarifies, stating, "For in six days the Lord made the heavens and the earth, the sea, and all that is in them, and rested the seventh day." The Creator equates the human work cycle with His own creative actions. No one would interpret a human workweek as spanning billions of years; similarly, there is no reason to understand God's Creation Week as anything other than normal, literal days. For the Israelites, who first received this command, the creation days would have been unmistakably understood as ordinary days. The symmetry between God's Creation Week and the Israelites' weekly cycle provides strong evidence for the literal interpretation of the creation days (Sarfati, 2015). Introducing the concept of long ages or millions of years conflicts with this plain reading of the text, creating unnecessary theological tension (Walton, 2009).

Psalm 90:4, which states, "A day is like a thousand years," and 2 Peter 3:8, which echoes this idea ("with the Lord one day is as a thousand years, and a thousand years as one day"), are sometimes cited to challenge the literal interpretation (Geisler, 2002). Yet these passages speak to God's timelessness and are unrelated to the duration of the creation days. Even if one were to accept the hypothesis that each creation day represents 1,000 years, this would place the Earth's age at only 12,000 years—still far from the millions or billions proposed by old Earth theories. Furthermore, Psalm 90:4 also asserts, "A thousand years are like a day," emphasizing that the verse reflects God's transcendence over time rather than providing a mathematical formula (Barrick, 2008).

In Genesis 1:14, the term "day" is contrasted with "seasons" and "years," providing a clear distinction in the cycles of time ordained by God. This verse states, "Let there be lights in the expanse of the heavens to separate the day from the night. And let them be for signs and for seasons, and for days and years" (Genesis 1:14, ESV). The verse's juxtaposition of day, season, and year serves as an anchor for understanding the temporal framework within the creation narrative. These terms correspond to observable cycles—daylight and darkness, seasonal changes, and annual rotations—which are universally understood and practical for human experience.

To interpret a "day" in Genesis as spanning billions of years introduces substantial challenges to the coherence of "seasons" and "years" in this verse. If a day were extended to one billion years, the duration of a season (approximately three months) would be disproportionate at 90 billion years, and a year would span an unfathomable 360 billion years. Such interpretations not only strain the practical application of these terms but also conflict with the straightforward reading of the text. By understanding "day" as a literal 24-hour period, the integrity and clarity of Genesis 1:14 remain intact, aligning with the historical and cultural context of its audience and preserving the logical consistency of the temporal framework established by Scripture.

Similarly, the *New Compact Bible Dictionary* claims that Scripture provides no specific details about the exact timing of the creation of matter or the precise moments when the first day began and the sixth day ended. However, such uncertainties are addressed in the opening words of the Bible: "In the beginning" (Genesis 1:1). Contrary to the notion that the Bible lacks sufficient information, Genesis offers clear and direct answers, framed in terms that its original audience would have comprehended (Beall, 2015).

Wayne Grudem, in his widely referenced *Systematic Theology*, also addresses the length of the days in Genesis 1. He suggests that God may have chosen not to provide enough information to reach a definitive conclusion. While Grudem emphasizes the importance of treating differing views with charity, it is equally important to recognize that Scripture consistently presents the creation days as ordinary, 24-hour periods (Grudem, 1994). Grudem's acknowledgment highlights the importance of the literal-grammatical-

historical approach to Scripture, which prioritizes the text's intended meaning over external reinterpretations (Beall, 2015).

Finally, the broader Biblical narrative supports this interpretation. Jesus Himself references the Genesis creation account in Mark 10:6, stating, "But from the beginning of creation, God made them male and female." This statement aligns with the literal timeline of Genesis, which places humanity at the beginning of creation rather than at the end of a long evolutionary process. Such consistency reinforces the coherence of a straightforward reading of the text, where the creation days are understood as ordinary days (Snelling, 2014).

By employing a literal-grammatical-historical hermeneutic, the young-Earth creationist perspective upholds the authority and clarity of Scripture. Genesis 1's repeated references to "evening and morning," its connection to the Sabbath commandment, and the broader consistency of Biblical doctrine all point to a plain reading of *yôm* as a 24-hour day. This approach resists external pressures to reinterpret the text in light of secular theories, maintaining Scripture's integrity and historical reliability (Barrick, 2008).

Concordance Study of the Hebrew Noun *Yôm*

This section expands beyond Genesis 1 to explore the broader lexical usage of *yôm* across Scripture through concordance studies. It highlights the varied meanings of *yôm*—literal and extended—within different contexts, such as Jonah's time in the fish and the Israelites' march around Jericho. This study underscores the theological coherence of interpreting *yôm* as literal days in Genesis 1, linking this interpretation to foundational doctrines like the Fall, redemption, and Christ's work. While brief consideration is given to instances like Genesis 2:4, where *yôm* is used more flexibly, this does not detract from its literal meaning in the creation narrative. The section also counters reinterpretations of *yôm* that introduce inconsistencies into the temporal framework of Genesis (e.g., with terms such as "seasons" and "years").

The Hebrew noun *yôm* holds pivotal significance for understanding the Genesis creation account and its timeline. Its interpretation in Genesis 1 shapes critical theological concepts, including the age of the Earth and the coherence of Biblical chronology. Across Scripture, *yôm* is used to signify both literal days (24 hours) and extended periods, but context remains the ultimate guide to its interpretation. In Genesis 1, the consistent pairing of *yôm* with ordinal numbers and the recurring phrase "evening and morning" reinforces its meaning as ordinary 24-hour days (Ham, 1987; Barrick, 2008).

Lexical Studies and Contextual Consistency

A concordance study of *yôm* across the Old Testament reveals that its literal meaning prevails overwhelmingly in narrative contexts. For instance, passages such as Jonah's three days in the belly of the fish (Jonah 1:17) and the Israelites' seven-day march around Jericho (Joshua 6:4) are understood universally as literal 24-hour periods. (Sarfati, 2015).

The repeated pairing of *yôm* with "evening and morning" strengthens this interpretation. Scholars such as Mark Koehne emphasize that this phrase functions as a boundary marker, delineating the end of one day and the beginning of another, leaving little room for non-literal interpretations (Koehne, 2018). This structure contrasts sharply with poetic or allegorical language found in Psalms and Proverbs, which employs symbolic imagery rather than precise chronological markers.

Theological Implications

Understanding *yôm* as literal, ordinary days upholds the coherence of foundational doctrines such as the Fall and redemption. As Jonathan Sarfati argues, interpreting *yôm* as extended epochs introduces theological tensions, particularly regarding the origin of sin and the necessity of Christ's redemptive work. If death existed for millions of years before Adam's sin, it undermines the Gospel's message that death is the result of sin (Sarfati, 2015). Thus, a literal reading of *yôm* preserves the theological integrity of Scripture.

Moreover, Exodus 20:9–11 reinforces the ordinary nature of *yôm*. This passage directly links the six creation days to the Israelites' workweek: "For in six days the Lord made the heavens and the earth, the sea, and all that is in them, and rested the seventh day." The symmetry between God's Creation Week and the human workweek affirms the literal interpretation, as no one interprets the Sabbath commandment as spanning millions of years (Ham, 1987).

Lexical Flexibility and Genesis 2:4

While *yôm* occasionally signifies extended periods, as seen in Genesis 2:4 ("in the day the Lord God made the earth and the heavens"), this usage aligns with colloquial expressions like "back in the day." Such extended meanings are context-specific and do not affect the interpretation of *yôm* in Genesis 1, where "evening and morning" clarify its ordinary sense. Wayne Grudem further highlights that context is key to understanding *yôm* across Scripture, and the Genesis creation account provides unmistakable markers of literal days (Grudem, 1994).

Defending the Literal Interpretation

Attempts to reinterpret *yôm* in Genesis 1 often stem from external pressures

to harmonize Scripture with secular scientific theories. However, these reinterpretations introduce inconsistencies within the Biblical narrative. For instance, extending the creation days into epochs disrupts the logical framework of Genesis 1:14, which juxtaposes "days," "seasons," and "years" as distinct cycles. If a "day" spans billions of years, the temporal coherence of "seasons" and "years" collapses, creating theological and practical difficulties (Barrick, 2008).

Furthermore, Psalm 90:4 ("A day is like a thousand years") and 2 Peter 3:8 ("with the Lord one day is as a thousand years") are often cited to challenge the literal interpretation. Yet these verses speak to God's timelessness rather than the duration of creation days. Even if applied mathematically, they place the Earth's age far below the billions proposed by secular models, reinforcing the young-Earth framework.

Genesis 1: Poetry or Historical Narrative?

As we consider the nature of the creation days, it is equally important to evaluate the literary structure of Genesis 1. Some scholars propose that the chapter employs poetic or symbolic language, yet a closer examination reveals its alignment with historical narrative—a critical aspect in affirming its literal interpretation and theological reliability.

The debate over the historical versus poetic nature of Genesis 1 builds upon broader discussions regarding the interpretation of *yôm* and the timeline of creation. As scholars and theologians continue to wrestle with these questions, some interpretations propose that Genesis 1 should be viewed as poetic or semi-poetic, introducing yet another layer to the discourse.

For example, Rob Bell refers to Genesis 1 as the "Creation Poem," while Meredith Kline describes it as semi-poetic, emphasizing its structural symmetry and artistic composition (Kline, 1996; Bell, 2011). Hugh Ross, a proponent of old-Earth creationism, offers a variation of the Day-Age Theory called "progressive creation," which interprets the days of Genesis 1 as extended periods lasting millions of years. Ross often applies a literal reading to poetic passages, such as those found in the Psalms, and then uses these interpretations to reframe narrative passages like Genesis 1 (Ross, 1994). Similarly, John Walton, in his *Lost World of Genesis One*, advocates for viewing Genesis 1 as an ancient cosmological text rather than a literal historical record. Walton argues that Genesis 1 reflects the functional ordering of the universe rather than material origins, proposing that its primary purpose is theological rather than scientific (Walton, 2009).

Additional proponents of poetic or symbolic interpretations include Tremper Longman III and Bruce Waltke, who suggest that Genesis 1 employs figurative language to convey profound truths about God's creative power and sovereignty (Longman and Waltke, 1993). Some scholars have pointed to the parallels between Genesis 1 and other ancient Near Eastern creation myths, such as the *Enuma Elish*, to argue that Genesis 1 shares characteristics of epic poetry or symbolic narratives common to its cultural context (Walton, 2009). These views, while varied, generally aim to reconcile the Genesis creation account with modern scientific theories about the universe's age and development.

Despite these perspectives, the literary structure of Genesis 1 provides compelling evidence that the text is not poetic but a historical narrative (Barrick, 2008). The style of Genesis 1 aligns with the rest of Genesis, excluding specific poetic segments such as Jacob's blessings in Genesis 49. Unlike poetic passages that employ symbolic language to evoke emotions or abstract themes, Genesis 1 meticulously chronicles the steps of creation in a structured and sequential manner. This detailed presentation underscores its purpose as a record of actual events rather than an artistic expression of ideas.

A key feature distinguishing historical narrative from poetry in Hebrew literature is the use of the *vav-consecutive imperfect*, a grammatical construction that conveys a clear sequence of events: "this happened, then this, then this." This form is extensively employed in Genesis 1, emphasizing the chronological nature of the creation account (Snelling, 2014). By contrast, Hebrew poetry relies on parallelism, the repetition of ideas in a balanced structure, and often incorporates figurative or symbolic language to explore deeper spiritual truths. The absence of such poetic hallmarks in Genesis 1 further solidifies its classification as a historical narrative.

The Hebrew grammar of Genesis 1:2 provides key insights into the relationship between verses 1 and 2, particularly in the use of the vav disjunctive at the beginning of verse 2. This grammatical construction contrasts with the vav consecutive that begins in verse 3 and onward, highlighting a break in the narrative flow to provide additional descriptive or explanatory information (Barrick, 2008).

The vav disjunctive in verse 2 links it directly to verse 1, offering further context for the initial act of creation described in the opening statement, "In the beginning, God created the heavens and the earth" (Beall, 2015). Rather than supporting a temporal gap between verses 1 and 2, the vav disjunctive underscores that Genesis 1:2 serves as a continuation of verse 1, elaborating on the initial state of creation as "formless and void." This foundational Hebrew grammatical indicator affirms the continuity of the text, leaving no room to insert millions

of years between these verses (Snelling, 2014). Instead, the passage describes a cohesive sequence: God created the heavens and the earth in an unformed and unfilled state, which He then shaped and completed over six literal days (Ham, 1987).

By grounding the interpretation of Genesis 1:1–2 in the text's grammatical structure, the clarity and coherence of the creation account are reinforced as a single, unified narrative (Barrick, 2008; Snelling, 2014). This interpretation aligns with a plain reading of the text while countering alternative models, such as the Gap Theory, which attempt to accommodate long ages within the Biblical framework (Mortenson, 2004). This distinction between poetic and historical prose is evident throughout the Bible. For example, the account of the Israelites crossing the Red Sea is presented in two contrasting styles. In Exodus 14, the event is narrated as prose: "Moses stretched out his hand over the sea, and the Lord caused the sea to go back by a strong east wind all that night." This detailed and step-by-step description gives readers a clear and factual record of the miraculous event. However, in Exodus 15, the same event is recounted poetically: "Pharaoh's chariots and his army He has cast into the sea…they sank to the bottom like a stone." While the poetic version captures the emotional and symbolic resonance of the event, the prose provides the precise sequence of what occurred. This distinction is critical when evaluating Genesis 1, as its prose style mirrors that of historical accounts, further affirming its literal nature (Barrick, 2008).

Additionally, Genesis 1's repeated use of phrases such as "and God said," "and it was so," and "there was evening and there was morning" reinforces its literal and historical tone. These recurring refrains serve not as artistic embellishments but as markers of the orderly progression of creation over six days. Each declaration of "evening and morning" denotes a 24-hour cycle, leaving little room for interpretations that extend these periods into epochs of millions of years (Ham, 1987).

Moreover, Genesis 1 lacks the symbolic imagery often found in Hebrew poetry. For instance, Psalm 19 poetically declares, "The heavens declare the glory of God; the skies proclaim the work of His hands." While this passage uses vivid imagery to convey theological truths about God's majesty, Genesis 1 adopts a straightforward and direct approach. The absence of such metaphorical language in Genesis 1 strengthens the argument for its historical nature, as the chapter prioritizes clarity over artistic expression (Snelling, 2014).

By presenting creation in a structured, sequential, and factual manner, Genesis 1 sets itself apart as a historical narrative. Its style reflects an intention to provide a reliable account of how the universe came into being, one meant to be understood plainly and literally by its audience. This reinforces its role as a foundational text for understanding the origins of the world according to the Bible.

Critics of young-Earth creationism, such as Ronald Numbers in *The Creationists*, contend that no prominent Christian theologians supported this view prior to the 20th century (Numbers, 2006). However, evidence suggests otherwise, as numerous historical figures within Christianity upheld a literal interpretation of the Genesis creation account. Both the Apostle Paul and Jesus treated Genesis as literal history, affirming its accuracy and reliability. For example, in 1 Corinthians 15:45, Paul refers to Adam as "the first man," underscoring the historicity of Adam and the events recorded in Genesis. Jesus also validated the Genesis account in Mark 10:6, where He declared, "But from the beginning of creation, God made them male and female," confirming the placement of humanity at the start of creation rather than as a later development in an evolutionary framework.

In addition to Biblical figures, influential theologians across Church history have consistently upheld a six-day creation. Martin Luther, a central figure of the Reformation, resolutely affirmed the literal reading of Genesis. He declared, "When Moses writes that God created heaven and Earth in six days, let this period continue to have been six days." Luther further emphasized the importance of trusting Scripture's plain meaning over human speculation, urging readers to accept the Holy Spirit's account of creation even when the intricacies of the process transcended human understanding. His stance reflects the broader theological tradition of taking Scripture at face value, especially in matters where divine revelation supersedes human reasoning (Batten, 2015).

John Calvin, another prominent Reformer, also advocated for a straightforward reading of the Genesis creation account. In his *Commentary on Genesis*, Calvin emphasized that Moses wrote in a style accessible to all, ensuring that even the unlearned could grasp the truths of creation. He rejected allegorical interpretations of Genesis, affirming that the text was meant to describe real events rather than abstract ideas (Calvin, 1847). Calvin's insistence on the clarity and literal nature of scripture further challenges the notion that young-Earth creationism lacked historical support.

Moreover, early Church fathers such as Basil of Caesarea and Augustine of Hippo also engaged with the Genesis creation narrative. While Augustine's views on the nature of the creation days were nuanced, and while differing on the mechanism and timing of creation, he nevertheless affirmed the direct involvement of God in creating the world and rejected the idea

that it arose through natural processes over vast ages (Augustine, 401). Basil, in his *Hexaemeron* (a series of sermons on the six days of creation), strongly defended the literal interpretation of the creation days, describing them as "ordinary days" marked by morning and evening (Basil, 370).

The claim that young-Earth creationism is a relatively modern development fails to account for these numerous historical endorsements of a literal Genesis. Such perspectives were not formulated in response to contemporary scientific theories but were instead rooted in a long-standing tradition of fidelity to Scripture. By treating Genesis as literal history, these theologians upheld the integrity of Biblical revelation and reinforced its foundational role in understanding God's creative work (Batten, 2015).

Hebrew Poetry in Genesis: Structure, Style, and Implications

Genesis 1 has long been a cornerstone of theological discourse, yet the debate surrounding its literary style persists. While the passage exhibits elevated language and a rhythmic structure, its classification as historical prose rather than poetry is crucial to understanding its purpose and reliability. A comprehensive examination of the text reveals that, while Genesis 1 contains stylistic elements reminiscent of poetry, such as repetition and parallelism, its core characteristics align with Hebrew historical narrative.

Distinguishing Poetry from Historical Prose

Hebrew poetry, as prominently found in Psalms, Proverbs, and Job, relies on hallmark features such as parallelism, metaphor, and symbolic imagery to convey theological and emotional truths. For instance, Psalm 19:1 poetically declares, "The heavens declare the glory of God; the skies proclaim the work of His hands." This verse employs vivid imagery to inspire awe and wonder. By contrast, Genesis 1:1 begins with the straightforward assertion: "In the beginning God created the heavens and the earth." This direct language focuses on factual events rather than metaphorical or abstract reflections (Jackson, 2007).

Dr. Steven Boyd's statistical analysis of Hebrew verb forms further supports the narrative nature of Genesis 1. By comparing the use of finite verbs in Genesis 1 with those found in historical accounts versus poetic texts, Boyd concludes that the verb patterns in Genesis 1 correspond overwhelmingly to historical prose. Specifically, the frequent use of the *vav-consecutive* (a grammatical structure denoting sequence) throughout the chapter reinforces its orderly, chronological presentation of events (Boyd, 2005; Snelling, 2014). This grammatical feature starkly contrasts with the parallel structures and lack of temporal markers found in Hebrew poetry.

The *CRSQ* has published research further substantiating the classification of Genesis 1 as historical narrative rather than poetry. For instance, B.T. Mann's paper, "A Critical Evaluation of the Tablet Model: Considerations on the Origin of the Book of Genesis" (Mann, 2017), delves into the literary and grammatical structure of Genesis 1. Mann critiques theories suggesting that Genesis derives from poetic or symbolic sources, instead emphasizing the pivotal role of the vav-consecutive—a grammatical construction indicative of sequential events in Hebrew historical prose. This feature, central to the text's structure, strongly supports the narrative flow of Genesis 1, directly contrasting with the parallelism and metaphor characteristic of Hebrew poetry. Mann's analysis, published in *CRSQ*, thus reinforces the argument that Genesis 1 was written as a straightforward account of real events, intended to be interpreted as historical prose.

Purposeful Repetition and Theological Rhythm

The repetition of key phrases in Genesis 1, such as "And God said," "And it was so," and "There was evening, and there was morning," creates a rhythmic structure that some interpret as poetic. However, this repetition serves a theological and structural purpose rather than a poetic one. By punctuating each act of creation with these refrains, the text emphasizes God's sovereign authority and the orderly progression of creation. Unlike the parallelism of Hebrew poetry, which often explores themes from multiple angles, the repetition in Genesis 1 underscores the sequential nature of the narrative, aligning it with historical recounting (Barrick, 2008).

This rhythm also reflects the liturgical purpose of the text. Scholars such as John Currid note that Genesis 1 was likely written to be recited or memorized, which may account for its rhythmic qualities. Currid argues that such qualities do not detract from the text's historical nature but instead highlight its pedagogical intent—to affirm the centrality of God's creative work in the lives of the covenant community (Currid, 2003).

Comparison with Other Ancient Near Eastern Texts

Some have drawn parallels between Genesis 1 and ancient Near Eastern creation myths, such as the Babylonian *Enuma Elish*. While these comparisons acknowledge the shared cultural context of the Biblical text, they also underscore its unique nature. Unlike the symbolic and polytheistic narratives of its contemporaries, Genesis 1 presents a monotheistic, orderly account of creation. It focuses on the direct actions of a single sovereign God, eschewing

the allegorical and dramatic elements often found in ancient mythologies (Snelling, 2014).

The structured progression of Genesis 1 also contrasts with the chaotic, often cyclical cosmologies of ancient myths. For example, the *Enuma Elish* depicts creation as the outcome of conflict among gods, whereas Genesis 1 portrays creation as a deliberate and harmonious act of divine will. This distinction reinforces the historical tone of Genesis 1 while highlighting its theological depth (Mortenson, 2004).

Implications for Young-Earth Creationism

Understanding Genesis 1 as historical prose rather than poetry has profound implications for interpreting the creation account. The historical framework of the text supports the literal six-day creation timeline central to YEC. A poetic or allegorical reading would introduce ambiguity into the text, weakening its theological claims and its coherence with other scriptural passages, such as Exodus 20:11, which explicitly links the creation days to the human workweek (Barrick, 2008; Ham, 1987).

Moreover, viewing Genesis 1 as historical narrative ensures the continuity of its theological message with the rest of Scripture. For instance, Jesus' reference to the creation account in Mark 10:6 ("But from the beginning of creation, God made them male and female") presupposes the historical reality of the events described in Genesis. Similarly, the genealogies in Genesis 5 and 11 trace humanity's lineage directly back to Adam, underscoring the necessity of a literal understanding of the creation account (Snelling, 2014).

Reaffirming the Foundations

Through an exploration of genealogies, creation days, and the historical framework of Genesis 1, this paper establishes the theological foundation for YEC. By reaffirming the authority of Scripture, it confronts the challenges posed by alternative views and emphasizes the coherence of YEC within a Biblically grounded worldview.

This paper reaffirms the theological foundations of YEC by emphasizing the authority of Scripture as the ultimate guide to understanding Earth's history and origins. A careful examination of Biblical genealogies provides a clear and consistent timeline, situating the Earth's age at approximately 6,000 years. This analysis, rooted in a literal interpretation of Genesis, reveals the coherence of Scripture and its integral role in shaping a Christian worldview. Further, the examination of the creation days and the historical narrative of Genesis 1 highlights the clarity and reliability of the Biblical text, affirming its intended message for the original audience and subsequent generations.

By addressing old-Earth interpretations, this paper confronts theological challenges such as death before sin and their implications for foundational doctrines, including the Fall, original sin, and Christ's redemptive work. These interpretations often undermine the central message of the Gospel, which is inextricably tied to the historical events described in Genesis. The necessity of maintaining a Scripture-centered approach is underscored by the observation of Augustine: "If you believe what you like in the Gospel, and reject what you don't like, it is not the Gospel you believe, but yourself." This statement challenges readers to adhere to the plain and clear teaching of Scripture, rather than conforming to external theories that dilute its authority.

Moreover, the plausibility of old-Earth interpretations is called into question by the inconsistencies they introduce into the Biblical narrative. For instance, the reinterpretation of creation days as indefinite periods departs from the straightforward reading of Genesis and creates tensions with the timeline derived from genealogies. Such models also grapple with reconciling the concept of death before the Fall, which directly contradicts the foundational Christian doctrines of sin and redemption. These issues highlight the theological and logical challenges of old-Earth perspectives, urging readers to reconsider whether such views truly align with the transformative truth of Scripture.

As the theological foundation for a broader exploration of YEC, this paper reaffirms the authority of Scripture as the definitive guide to understanding Earth's history. By examining Biblical genealogies and the creation narrative, it situates the Earth's age within a coherent theological framework, while challenging old-Earth interpretations that conflict with foundational Christian doctrines. The analysis presented here sets the stage for subsequent papers that will integrate scientific and philosophical perspectives, forming a holistic defense of YEC. This series ultimately seeks to demonstrate the coherence of faith, Scripture, and reason in reclaiming Earth's history through a Biblically grounded lens.

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Conference Reports

Review of 12th Annual CRS Conference

2025 CRS Conference Abstracts

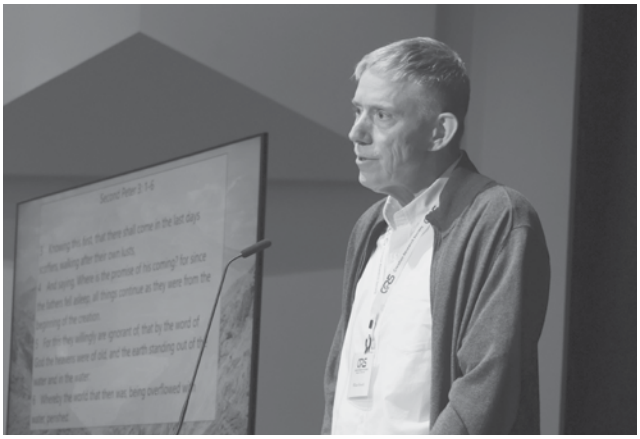
The Creation Research Society held its 12th Annual Conference on July 25–27, 2025, at Missouri Baptist University, St. Louis, MO.

It was one of the largest conferences to date, with 190 in attendance. Workshops in the disciplines of astronomy, biology, and geology were held on the first day of the conference.

Plenary sessions were given by Jake Hebert and Joe Deweese on Friday and Saturday mornings, respectively.

Bill Hoesch delivered the Henry Morris Memorial Lecture on Friday evening, entitled *In the Wilderness: Creation Science, Then and Now.* The lecture was open to the general public, as well as to attendees.

Thirty-five research presentations were given on Friday and Saturday. The abstracts for these talks are listed below:



Bill Hoesch delivering the Henry Morris Memorial Lecture.

John Baumgardner

High-Resolution Modeling of Erosion, Sediment Transport, and Deposition by Giant Tsunamis During the Genesis Flood

This research applies a 1D version of the shallow-water equations, combined with treatments of erosion and turbulent sediment transport and deposition, to simulate the actions of large tsunamis as they move from regions of the deep ocean onto the continents during the Genesis Flood. Previous work (Baumgardner and Navarro, 2023) modeled the full global domain using the 2D shallow-water equations, but with spatial resolution insufficient to capture many important details, especially those relating to sediment deposition. By restricting the number of horizontal dimensions from two to one, it becomes possible to achieve dramatically better resolution of sediment transport and deposition processes. This work utilizes the same open-channel flow equations as before to model the suspension, transport, and deposition of sediment in the turbulent boundary layers that occur as giant tsunamis repeatedly invade and recede from the continental surface. The scheme resolves the strongly sheared layer of turbulent water into ten sublayers and also resolves the sediment particles into four distinct size classes. A significant advance this new treatment provides is the resolution of the deposited sediment into individual layers, each with its own particle size distribution. This work brings into much better focus how giant tsunamis during the Flood produced the notable sequence of horizontally extensive sediment layers with flat boundaries between them so conspicuous in the record.

Michael Boyle, Randy Guliuzza

Astyanax mexicanus: A Divinely Engineered Exemplar of Organism-Driven Adaptation

At the Institute for Creation Research, we have constructed an original model to explain the early development and

deployment of adaptive traits. By continuously tracking conditions within their environments, we predict that all animals will self-adjust through molecular, cellular, and physiological mechanisms to optimize functional anatomy. We anticipate finding evidence to support our prediction through ICR's innovative research program. The experimental model is *A. mexicanus* (Mexican Tetra), with laboratory stocks consisting of interfertile surface-dwelling and blind cave-dwelling morphotypes from northeastern Mexico. While cavefish are eyeless and minimally pigmented, trait optimizations include metabolic, sensory, respiratory, olfactory, and gustatory adaptations specific to subterranean environments. Recent experiments have demonstrated that melanin pigmentation is reversible, DNA barcoding enables identification of conspecific *A. mexicanus* strains, and confocal microscopy is proving valuable for characterizing microanatomy. Additionally, breeding methods are providing access to embryonic and larval stages for comparative analysis and experimentation. Here, we will present the developmental distribution and cellular anatomy of neuromasts (hair cells) within lateral line organs (LLO) of larval cavefish as adaptive compensations for vision loss in eyeless fish. Going forward, we will initiate molecular protocols to investigate the expression patterns of genes that are known to regulate eye formation. Importantly, compensatory adaptations are not limited to fish. Eyeless, minimally pigmented salamanders, arthropods, molluscs, platyhelminths, and annelids also inhabit caves. Therefore, a diversity of dissimilar body plans are responding to similar environmental conditions in a similar way, supporting our inference that common organism-driven adaptations are divinely engineered by a common Designer.

Joel Brown, Faith Vandenberg

CRS eKINDS UPDATE: Untangling the Prickly Baraminology of an Iconic Group of Desert Plants, Family Cactaceae

Cacti (Family Cactaceae) comprise a diverse group of armored plants adapted to arid environments. The absence of cacti in the fossil record and their restricted global distribution suggest most of this diversity has arisen post-Flood. The objective of this study is to use morphology, hybridization, and, especially, molecular data to determine whether Family Cactaceae represents exactly one, more than one, or fewer than one created kind.

Based on morphology, we proposed three putative holobaramins in Family Cactaceae and then performed pairwise comparisons between chloroplast DNA (cpDNA) to examine the genetic similarity within and between these holobaramins. This molecular approach predicted two holobaramins which differed from those predicted by morphology. The differences are due, in part, to substantial rearrangements in cpDNA which skew sequence similarity scores, leading to groupings that may not accurately reflect baraminic relationships. To address these challenges, we have developed new tools to compare large sequences for molecular baraminology.

The usefulness of molecular data in clarifying baraminic relationships remains the subject of debate. This research demonstrates potential for molecular data in baraminology as long as several lines of evidence are used to establish discontinuities and precautions are taken to protect against artifacts that may arise in large-scale genetic analyses. This study also highlights the immense amount of genetic and morphological diversity that has apparently arisen in this prickly plant family since the Genesis Flood. Understanding the driving forces behind this rapid diversification remains one of the great questions in Creation biology.

Kyle Canfield, Leo (Jake) Hebert III

Tephra Fallout Times, Inflated Ice Core Ages, and Creationist Ice Sheet Models

In 1993, Larry Vardiman proposed an analytical young-Earth ice sheet model (horizontal layering and no basal melting). Hebert later used the more sophisticated Mahaffy model to simulate the rapid formation of thick, post-Flood ice sheets. The apparent frequencies of volcanic tephra layers in the deep Antarctic ice cores provide strong evidence that the uniformitarian ice core ages are greatly inflated, as does the apparent fallout time of one particular tephra deposit in Antarctica's Dome Fuji ice core. Here, we strengthen the argument for inflated apparent tephra fallout times. Because little melting is thought to have occurred at the EPICA Dome C core, and because of the horizontal layering at the core site, the EPICA Dome C core is a good choice to compare creation and uniformitarian expectations. We use Vardiman's model to find apparent tephra fallout times and compare them with those obtained from the uniformitarian age model. The uniformitarian model implies unrealistically long fallout times, usually measured in months and even years. However, Vardiman's model provides more realistic fallout times, measured in just days, as one would expect from short, explosive volcanic eruptions. The young-Earth model also implies that most of the tephra layers were deposited during the post-Flood Ice Age, as one might

expect due to intense residual post-Flood volcanism. We discuss efforts to do the same with the Mahaffy model, and we discuss efforts to apply the much more sophisticated Blatter-Pattyn ice sheet model to the problem of modeling rapid post-Flood formation of ice sheets.

Robert Carter

Testing the 'Genealogical Adam and Eve Model'

Dr. Joshua Swamidass has developed a unique model of human originals called the 'Genealogical Adam and Eve Model'. In it, he postulates that God could have selected an Adam and Eve from an evolved human population and conferred on them 'humanness'. Alternatively, God could have created an Adam and Eve de novo, but with no genetic distinction to the population in which they lived. Over many years, their children would have interbred with the non-humans, causing their genealogy to spread out among the population, but not necessarily their DNA, which would have been lost over time. This model has been rigorously tested with a population modeling software I have recently developed. His assumptions about genetic and genealogical ancestry are wrong. That is, genealogical ancestry, even though it spreads faster than genetic ancestry, is not guaranteed to propagate through a population. Also, genetic ancestry is not guaranteed to disappear, even when the population is large and only a single individual is being tracked. Worse, geographic separation and uneven local mating patterns complicate the picture to the point where one cannot say that all people are (genealogically) descended from Adam by the time of Christ, which raises massive theological problems.

Timothy Clarey, Davis J. Werner

Megasequences Across Australia, New Guinea, and New Zealand Support a Progressive Global Flood

Previous geological studies across five continents (North and South America, Africa, Asia, and Europe) have shown that the global Flood was progressive, peaking in the Zuni Megasequence and receding in the Tejas. Recently, a geological analysis of Australia and surrounding islands, including New Guinea and New Zealand (Australasia), was completed. Seven sedimentary megasequences were correlated and mapped using 486 columns compiled from oil wells, cores, seismic profiles, and outcrops. RockWorks software was used to create isopach and basal lithology maps for each of the megasequences. Results show a chapter-by-chapter progression of the Flood across Australasia, similar to other continents, with one exception. Australasia has a higher percentage of Pre-Sauk Megasequence sediment compared to any other continent. However, the earliest generally accepted Flood sediments, starting in the Cambrian, and corresponding to the Sauk, Tippecanoe, and Kaskaskia Megasequences, exhibit minimal surface coverage and volume, similar to the other five continents. Later megasequences increase dramatically in surface coverage and volume. The Zuni Megasequence has the most sedimentary volume (after the Pre-Sauk) and the second-most surface extent, confirming that it corresponds to the peak of the Flood (Day 150). The final megasequence (Tejas) has the most surface coverage, both on and offshore, of any megasequence, suggesting it was the receding phase of the Flood (Days 151–314). Extensive offshore coal seams in Tejas sediments support this interpretation.

Matthew Cserhati

Mitogenome-Based Baraminology Analysis for Finding the Baraminic Cutoff Value in Various Taxonomic Levels of Mammals

One of the techniques used by molecular baraminology is using a sequence similarity cutoff value to either join two species into the same baramin or separate them. After several studies, a specific cutoff value is still lacking.

This cutoff value can be determined by measuring the range of sequence similarity values among species of the same kind. The mitochondrial genomes of 1,005 mammalian species from the NCBI database were cross-compared. The lowest sequence similarity value was taken as a possible cutoff value for any given kind. The distribution of all such minimum sequence similarity values was analyzed over various putative kinds, defined on the genus, family, or order level.

The minimum sequence similarity values were normally distributed without multimodality for all three taxonomic levels. The minimum sequence similarity and the number of species/genera in the genus/ family were weakly negatively correlated (-0.374/-0.343). The correlation between the minimum sequence similarity and the number of species in the order was strong and negative (-0.634). Since the level of the kind rarely reaches that of the order, only genera and families were examined more closely.

The lowest minimum sequence similarity values for genera and families were 83.2% and 75%, respectively. Since

the level of the kind in this study was between the genus and the family, the similarity cutoff whereby two species can be classified into the same or different baramins is 75–83.2%.

The data used in this analysis is available in the Mitogenome Analysis Tool at the Molecular Baraminology Analysis Tool Suite (https:// molbar.shinyapps.io/molbar).

Joseph Deweese, Lily Simpson, Carissa Shipman, Andrew Fabich

Refinement of Fossil DNA Extraction Protocols in Preparation for DNA Sequencing

Modern DNA sequencing technologies have advanced rapidly, decreasing both time and cost. Further, the ability to process DNA sequencing information has likewise advanced, making analyses faster and more robust. While sequencing has generally focused on contemporary DNA sources, there is growing interest in ancient DNA (aDNA) from fossil samples. So-called ancient fossils have generally been assumed to lack residual DNA due to fragmentation and fossil mineralization across deep time. However, a young-Earth model proposes a much younger age for fossils, which suggests at least the presence of fragmentary DNA. In an effort to prepare for sequencing aDNA from fossils, we tested several extraction techniques, including diverse buffers, conditions, and timeframes. Based upon this work, we report that sodium phosphate buffer with EDTA gives better extraction compared with Tris buffer with EDTA. Also, increasing temperature and agitation of the sample lead to higher DNA yields. DNA sequence quality scores of reads also improved through using a DNA cleanup kit prior to preparation for sequencing. To date, we have confirmed extraction of DNA from several fossils, including those considered "Ice Age," and we are working to confirm the identification of fragments from samples with known reference genomes. This effort demonstrates progress toward the sequencing of aDNA from fossils, which is consistent with Flood- and post-Flood origins of many fossils.

Randy Guliuzza, Michael Boyle

Engineered Biology: The Theory of Biological Design Radically Alters How People View Biology

In 1974, Dr. Henry M. Morris outlined the concept of biological design (Scientific Creationism). Yet, in 2025, a common question remains, "How does someone begin to think about biology and interpret observations within an engineering framework?" If engineered biology is in fact the most basic element of God's general revelation of Himself to humanity, then the ability to understand that creatures are engineered and to explain how they operate within an engineering framework would seem to be a skill of utmost importance. Seeing engineered biology is intuitive, but explaining it requires that creationists develop something new—a theory of their own. ICR is leading some creationists and a pioneering branch of Intelligent Design (ID) advocates to develop a Theory of Biological Design (TOBD). This theory constrains researchers to think about, frame questions on, and approach biological research in a radically different way from Darwinism. To test and advance the TOBD, we are employing methods involving literature reviews and empirical studies on cavefish (*Astyanax mexicanus*). Based upon results of these studies, research-driven revisions to the TOBD (up to July 2025) are presented that will address basic assumptions and premises, and how an engineering perspective better explains the evolutionist's recent claims of "evolving evolvability" (Barnett, *Science*, 2025). Our conclusions emphasize ways to interpret common biological observations in both the literature and empirical studies within the parameters of engineering-based assumptions and premises, and to make specific predictions to guide a research program as is currently progressing with ICR's cavefish project.

Cyrus Harris – Future Leader, John Baumgardner, Wayne Strasser

Numerical Modeling of Steam Jet Originating from the Ocean Bottom Above a Spreading Ridge During the Genesis Flood: Initial Results

We apply the commercial software package Ansys Fluent, a state-of-the-art program for simulating unsteady fluid flow, heat transport, and chemical reactions in complex geometries, to model a steam jet that emerges from a spot of molten rock on the ocean bottom during the Genesis Flood. To simulate this problem that includes both liquid and vapor phases of water in Fluent, we choose an Eulerian VOF (volume of fluid) method with an interface capturing technique, together with a standard K-e turbulence scheme. For simplicity, we assume a bottom boundary condition of steam at 1500 K flowing through a circular aperture 100 m in diameter at 850 m/s. To avoid the complication of supercritical water, we limit the oceanic water depth to 2200 m. We include an atmosphere extending

to 9.8 km above the ocean surface and allow for outflow above the atmospheric layer. We obtain a strongly time-varying solution that displays vigorous entrainment of ocean water by the turbulent jet as it traverses the ocean layer. A significant volume of ocean water is lofted several kilometers into the atmosphere. This liquid water then falls back to the surface as rain. The record of seafloor spreading preserved in today's ocean bottom igneous rocks indicates that more than 50,000 km of mid-ocean ridges were active during the Flood. This suggests that hundreds of thousands of jets similar to the one we modeled were in operation during the prevailing phase of the Flood cataclysm.

Leo (Jake) Hebert III, Luke Frazeur

Evidence for Greater Pre- and Immediate Post-Flood Animal Longevity: Status Report and Ongoing Research

At the 2023 International Conference on Creationism, preliminary evidence was presented that suggested pre-Flood animals experienced much longer lifespans than their modern-day counterparts, consistent with the longer human lifespans recorded in Genesis 5 and 11. Given that these lifespans are the subject of intense skepticism, this topic should be of great interest to creationists. Longevity studies of living animals have repeatedly shown positive correlations between longer lifespans, larger adult body sizes, and greater ages at maturity. Giantism is widespread in the fossil record, and there is evidence that at least some mammals, crocodilians, sharks, and bivalves were experiencing delayed maturation. Moreover, ontogenetic growth curves have provided direct evidence of extreme longevity in small Jurassic mammals and fossil Crassostrea oysters. So far, five technical papers and a number of shorter articles have explored these lines of evidence in greater detail. This paper presents new, as-yet unpublished explorations of additional evidence for greater longevity in fossil bivalves from Japan and the Gulf of Aqaba, as well as in Antarctic bivalve and ammonite fossils. Our results include a follow-up discussion of research on indirect evidence of greater longevity in fossil birds and efforts to use allometry and scaling laws to gain insights into pre-Flood ontogeny. We suggest that evolutionists could be misinterpreting differences between fossil and extant creatures (e.g., teeth in fossil birds but not in extant birds) as evidence(s) for a presumed evolutionary history, rather than as ontogenetic differences due to the shortened lifespans of modern creatures.

Robert Hill

Magnetocentrifugal Mechanisms for Angular Momentum Transfer and Star Formation Models

Angular momentum is a recognized problem for star-formation models. Stars have less angular momentum than the nebula that supposedly produced them. How did stars lose their angular momentum? The talk "Bipolar Flows and Angular Momentum Transfer" from the 2024 CRS Conference presented observational evidence that a T Tauri star can lose enough angular momentum by bipolar flows to turn into a main-sequence star in a few thousand years.

Star formation theories claim that most of the angular momentum of the system occurred before the T Tauri stage of a star. This presentation will examine proposed magnetocentrifugal mechanisms for angular momentum loss before the T Tauri star stage. Magnetocentrifugal mechanisms are thought to account for much of the angular momentum loss of the system. The theory of magnetocentrifugal mechanisms will be explored. The proposed evidence(s) for magnetocentrifugal mechanisms will be examined. Suggestions for creationist research involving angular momentum transfer will be discussed.

Mark Horstemeyer

Creationeering the Astrosphere

Evolutionary proclamations of the universe assume a non-intelligent Big Bang with a 13.8 billion-year requirement for all of the evolutionary changes to occur. We counter the evolutionary argument from a Creationeering paradigm related to the astrosphere. Astronomers and astrophysicists who are creation scientists have asserted that God designed and made the heavens but have not clearly described the process by means of an engineering method. This multi-objective optimization creationeering approach employs the design objectives, constraints, and variables at different length scales related to the universe, super-cluster galaxies, local galactic group, the interstellar neighborhood of stars, and the Sun/Moon/Earth system. A Pareto frontier is discussed in the multi-objective solution space, showing that multiple objectives at each length scale demand an intelligent engineer outside of the designed system. As such, this presentation lays a foundation for future astronomical and astrophysical studies to start from the Creationeering paradigm and not the evolutionary Big

Bang paradigm, where no intelligent engineer was present at the beginning. Finally, this paradigm can inform future cosmological studies from a Biblical perspective and from a young-Earth Creationism perspective.

Kevin Horton

Aerial Photography Identification of Bottom-End Hanging Canyons: A Diagnostic Key to Understanding Changing Flow Patterns in the Genesis Flood

The Glacial Lake Missoula Flood (GLMF) has been studied with the use of drone photography and was presented at the 2024 conference by the author. Hanging canyons are a diagnostic feature of massive flooding and the result of rapidly changing water flows leaving the lesser channel hanging, not eroded to the bottom of the main canyon. This presentation will discuss hanging canyons in which the top end of the canyon is cut off, leaving the bottom of the canyon hanging. The author will present his hypothesis of how rapidly changing water flow patterns result in these previously unidentified features. Drone videography, photography, along with Google Earth evaluations will aid in the identification of these canyons. These were never identified with the GLMF. Four cases of bottom-end-hanging-canyons will be presented: Cascade Butte, Cascade, MT, the Little Missouri Badlands of North Dakota, cliffs above Moab, UT, and the convergence of the Little Colorado and Colorado Rivers. It is hypothesized that these unusual hanging canyons were formed by the rapidly changing current flows during the channelized flow phase of the Genesis Flood. A scenario for each case will be presented based on drone research discoveries. The last case will add to Oard's hypothesis (*CRSQ*, March 2011) for the origin of the Grand Canyon related to the convergence of the Little Colorado and Colorado Rivers, adding the evidence of a massive kolk or eddy forming at the convergence.

Ellie Johnston – Future Leader, Ryan Anderson, Faith Vandenberg, Joel Brown

CRS iDINO UPDATE: Establishing Decay Rates for Bone Collagen in Different Organisms Using Fourier Transformed Infrared Spectroscopy

Collagen, the most abundant protein in vertebrates, possesses exceptional stability due to its triple helical structure, yet it is still subject to degradation over time. The discovery of collagen in dinosaur fossils dated over 65 million years old was surprising in light of theoretical limits to its persistence. Despite this mystery, few studies have attempted to empirically quantify the decay rate of bone collagen. Our lab uses Fourier-transformed infrared spectroscopy to analyze collagen content in powdered-bone. By artificially treating modern mammalian, reptilian, and avian bones with heat, we accelerated decay and determined empirical thermal decay curves for bone collagen. Our studies found the half-life of bone collagen at 25 °C in a neutral aqueous environment to be 1588, and 327 years for mammalian and avian samples, respectively. Under these conditions, bone collagen levels will drop below <1% in less than 10,000 years. Even at lower temperatures (10 °C), the life expectancy of collagen falls far short of the conventional ages assigned to the dinosaur bones in which it is found. While several factors impact collagen decay besides thermal properties, such as the presence of microorganisms, which would accelerate decay, and the presence of crosslinking, which may prolong decay, our data establish a baseline with which to compare ongoing experiments aimed at testing proposed models of preservation. If plausible preservation methods cannot be identified that significantly extend the decay rate of collagen, then the assigned ages of these fossils should be re-examined.

Marshall Jordan

Mapping the Babel Dispersion with Radiocarbon and Genetic Data from Ancient Human Remains

The Allen Ancient DNA Resource (AADR) contains radiocarbon, genetic, and geographic data for ancient human remains, allowing the Babel dispersion to be investigated with radiocarbon dating using a Biblical timescale. The genetic data from ancient DNA allows absolute time stamps to be applied to deep branch points in the Y chromosome tree as it grew before and after the dispersion. With metadata from the AADR, world maps were made in 100-year increments and marked with sample locations dated from the Flood (2500 BC) to Abraham (2000 BC). These maps show a time-lapse geographic dispersion from Babel. Although the AADR database is a poor proxy for ancient human population sizes, the dates of the earliest human remains on each continent may reflect the arrival of the first humans fleeing the Babel event. This analysis suggests that the Babel event caused rapid dispersion into

Europe, Asia, and the Americas within 200 years of the Flood. Furthermore, Biblical radiocarbon dates assigned to the deep branches of the Y chromosome tree suggest that the major haplogroup marker mutations to Noah's sequence existed by the time of the Babel dispersion, and these characterize the first male lineages to arrive in Europe, Asia, and the Americas after Babel. While Noah and his sons were still alive, and before the birth of Abraham, the world was repopulated. God used the Babel dispersion to accomplish his purpose rapidly so that Noah and his three sons would "be fruitful and multiply and fill the earth" (Genesis 9:1).

Mary Beth Kaiser

Is Earth in a Cosmic Void or a Cosmic Wall?

My research is a comparative analysis of two inhomogeneous cosmological models: cosmic void, typified by the Lemaître–Tolman–Bondi (LTB) models, and cosmic wall, exemplified by the more recent Timescape Cosmology. Both frameworks aim to explain observed cosmic acceleration without invoking the problematic dark energy, but rather attributing large-scale inhomogeneities to variations in gravitational potential and clock rates. The cosmic void model posits that Earth resides near the center of a vast underdense region, leading to an apparent acceleration of the universe's expansion. Though the details are different between this long-age, secular cosmology and Humphrey's young-Earth creation cosmology, both contain the same boundary condition that Earth is near the center of a bounded universe. In contrast, the cosmic wall model proposes that Earth resides in a denser region (wall) where gravitational time dilation causes slower local clock rates relative to rapidly expanding voids. The concept that clocks are ticking at different rates in different parts of the universe is useful to creation cosmologies in accounting for the starlight travel time problem. I will evaluate these secular models against key observational datasets, including type 1a supernova luminosity distances and cosmic microwave background anisotropies. By separating objective observations from the false Big Bang interpretations, my findings will highlight how the data best undergird the most viable creation cosmologies. The aim is to chisel out a more precise young-Earth creation model of the universe for future research to build upon.

Hannah Klein

Young-Age Indicators in Creation Astronomy

A survey done in 2019 by Faulkner evaluated 48 age determination methods used by creationists to indicate a young age for the universe. We categorize these young-age indicators surveyed by Faulkner into four basic lines of argument:

- Arguments based on the accumulation of an effect over time.
- Arguments against the story of naturalistic evolution.
- Arguments based on the transience of physical features or entities.
- Arguments based on inherent instability.

The latter two of these categories impose the concept of an expiration date on either the universe as a whole or certain features within it. While this works as a convenient way of disproving evolutionary models of the universe and solar system, these young-age indicators need to be considered within the context of a creationist model as well. Do creationists believe that the universe was created by God with an expiration date? Or are these winding-down processes as a result of the Fall? Faulkner's survey noted that the primary motivation for determining a young age for the universe is to disprove evolutionary models. Because these determinations of a young age for the universe are motivated by an effort to disprove evolutionary models, they are often divorced from any positive creation model-building context. Creationist astronomers need to ensure that arguments for a young universe fit within the confines of their models of creation astronomy.

Zachary Klein

Tracking the Zanclean Flood: A Creation Geology Perspective on the "Largest" of the Megafloods

The Zanclean Flood is a hypothesized megaflood event that reconnected the Atlantic Ocean with the Mediterranean basin, at the beginning of the Pliocene epoch. This event is credited for catastrophic erosion of the Camarinal Sill, erosion of canyons on the Mediterranean seafloor, submarine "mega-bar" deposits, and onshore contouric deposits and erosional remnants. From a secular perspective, the Zanclean Flood is alleged to be the largest megaflood in the geologic record, vastly exceeding Ice Age megafloods such as the Lake Missoula Flood in volume and flow rate. Growing acceptance of the Zanclean Flood theory illustrates the

movement among conventional geologists away from strict uniformitarian interpretations and towards a recognition of catastrophic processes in explaining geologic features. The Zanclean Flood theory has several aspects of significance to creation geology. Proponents of the model have advanced lines of geologic and geomorphologic evidence that warrant careful review from a creationist perspective. Ongoing debate within the creation geology community over the chronostratigraphy of the Flood, especially the Flood/post-Flood boundary, suggests that creationists need better-defined and weighted criteria for distinguishing Flood and post-Flood deposits. The Zanclean Flood theory provides a useful test case for such criteria. The key question that must be answered is whether the deposits and erosional features attributed to the Zanclean Flood can be explained in terms of Flood processes or if they require a post-Flood context in which to form. More research is needed, including original field work, to constrain this event within a Biblical creationist chronology.

Nayeon Lee

Hierarchical Surface Engineering of Flower Petals for Self-Cleaning Functionality

"Why are you anxious about clothing? Consider the lilies of the field, how they grow: they neither toil nor spin, yet I tell you, even Solomon in all his glory was not arrayed like one of these" (Matthew 6:28–29). Flower petals exhibit remarkable aesthetic qualities through their vibrant colors and macroscopic petal arrangements; however, they also possess meticulously engineered surface designs for self-cleaning functions. In this study, the flower petals were characterized in their hierarchical micro- and nanostructures under scanning electron microscopy and quantified, their hydrophobic properties by measuring contact angles to investigate their structure-property relationships. SEM images revealed two distinct surface features: nanoscale grooves in 100–200 nm ranges, and microscale pillars in 10–30 μm ranges. Regarding the size of water vapors, which is 0.1–10 μm, water vapors could easily be anchored on the nano groove surface to minimize surface energy, which is called the water pinning effect. As the size of a water droplet gets bigger and reaches a size of the micron scale, nanopillar structures in 10–30 μm range induce water droplet rolling down. To measure this hydrophobicity, contact angles were measured on negative impressions of flower petals by dropping 5 μl deionized water droplets. The results show that contact angles were measured 139–152° in six flower petals, indicating a superhydrophobic property. These findings demonstrate that the combination of nanoscale hydrophilic grooves and microscale hydrophobic pillars enables flower petals to have efficient self-cleaning capabilities.

Ying Liu

Has Adaptive Evolution of SARS-CoV-2 Hit a Ceiling?

Viruses can demonstrate evolutionary processes that take "deep geological time" in higher organisms. During the past five years, SARS-CoV-2 has successfully adapted to the human host and established human reservoirs for long-term coexistence with mankind. We have observed innovative synergistic mutations in the spike protein to improve receptor binding. Adaptation to cells of the upper respiratory tract has shortened the incubation period and facilitated viral spread. Such improvements allowed for neutral and/or loss-of-function mutations to evade host immune response and to penetrate herd immunity. Adaptive mutations have resulted in intermittent selective sweeps by dominant variants. However, there are limitations to functional improvements. Receptor binding affinity of the spike protein peaked in 2022–2023. Accumulation of fixed mutations plateaued after the advent of BA.2.86/JN.1 at the turn of 2023 and 2024. Purifying selection has been the main force working on nonsynonymous mutations in the Omicron group, and overall fitness effects of missense mutations in major viral proteins have been declining. Moreover, because of weak selection on synonymous mutations, the codon adaptation index in the human host has been decreasing among Omicron sublineages. Consequently, Omicron variants replicated less efficiently than the original virus, and recent Omicron variants showed signs of further attenuation in animal models. Viral attenuation in the human population manifested as declining COVID-19-related mortality even though viral prevalence remained high. Thus SARS-CoV-2 showcased "The Edge of Evolution" described by Michael Behe, and "Genetic Entropy" championed by John Sanford.

Nate Loper

Slaying a Sauropod: Decoding the Kachina Bridge Petroglyph as Part of a Navigational Map

The famous petroglyph at Kachina Bridge in Natural Bridges National Monument, Utah—often called the 'sau-

ropod petroglyph'—has been the subject of debate among archaeologists, historians, and proponents of Biblical creation. Frequently cited as evidence that Native American cultures may have encountered living dinosaurs—either witnessing such creatures firsthand or preserving their likeness through oral tradition— the figure has been widely featured in literature, documentaries, and conference presentations. However, despite its prominence in these discussions, the petroglyph has rarely been examined firsthand by researchers and, to the author's knowledge, had not been formally studied in situ by any young-Earth creationist with archaeological training or experience in Native American rock art—until now.

This study presents a comprehensive field investigation of the Kachina Bridge petroglyph using archaeological methods and indigenous rock art interpretation. Through direct documentation, comparative content analysis, and a survey of related sites, this research establishes that the petroglyph is not a representation of a dinosaur but rather part of a large-scale geographical map. This map details a network of travel routes, rivers, geological features, and settlement locations spanning approximately 70,000 square miles across Utah and eastern Nevada, with some referenced sites extending as far as 350 miles away.

This paper presents and supports a new interpretation, identifying the Kachina Bridge sauropod petroglyph as part of a geospatial record rather than a depiction of an animal. These findings offer insight into Native American mapping traditions and call into question previous assumptions about the petroglyph's meaning and purpose—striving for archaeological and contextual accuracy.

Andy McIntosh

Demonstration of Bombardier Beetle Spray System Applied to a Fire Sprinkler

Research at the University of Leeds, UK, established the principle of how the bombardier beetle spray system uses a twin-valve system of an inlet and exhaust valve to eject a series of explosions about 400–500 times a second from its tiny 1mm explosion chamber. We are now looking to build a proof-of-concept experimental rig at Liberty University. This will demonstrate the bombardier beetle valve system using a small working model to show young people how the beetle makes an extraordinary series of blasts. Such a working model can then become a showcase example of creation design in the natural world.

The rig would also be a research tool for testing different-sized chambers, orifice sizes, and valve timings with a view to testing the feasibility of this valve mechanism being used as a sprinkler water/vapor fire-suppression system. This could be applied to vehicles where water weight is crucial and yet fire safety is vital, such as submarines and space vehicles, where a fire is usually catastrophic. To carry much fresh water for a traditional sprinkler system is impractical and prohibitive in cost (especially in space). The advantage of this novel system would be in spraying a water/vapor mist directed precisely at a potential hot spot, by using an infra-red camera to detect the heat source, and thus directing a moveable nozzle at the potential fire hazard.

Nathan Mogk

Towards an Event-Based Stratigraphy of the Flood

Derek Agar once described the conventional view of the rock record as consisting of long periods of boredom and short periods of terror, implying that geological events which we can see in the rocks today were infrequent and isolated in the vast eons of time. By contrast, the rocks laid down by the Genesis Flood imply extremely dynamic geological events that were adjacent to each other in time and space.

The megasequence concept has been a useful tool for understanding the Flood in the global context. New, publicly available data and techniques allow us to refine the identification and timing of megasequences and to keep the global picture while considering finer sequence divisions. In this study, I mapped unconformity-bound sediment packages across North America over time. The dynamic nature and movement of geologically significant events can be seen. Including paleocurrent data, this provides the first steps in constructing an event-based model of the Flood, which would consist of day-by-day sequences of events. This technique may be useful to discover regions of widespread upper-flow regime deposits.

Additionally, based on the methodology of Peters (2008), I found megasequence subdivisions in addition to those found by Sloss (1963) and timing refinements for megasequence boundaries. I also explored the relationship between megasequences and biostratigraphy, finding good correspondence between sequences and Wise and Richardson's (2023) Number of Local Sequence Straddling Species metric.

Noah Nicklas – Future Leader, Rebecca Garcia

Exploration of Ancient DNA Bone Extraction on Triceratops Fossils

The exploration of *Tyrannosaurus rex* fossils shows signs of cells, tissues, and proteins. Unsuccessful attempts have been made to isolate deoxyribonucleic acid (DNA) due to environmental contamination or inadequate amounts of DNA; however, we believe that advances in DNA technology may make it possible to extract and analyze ancient DNA (aDNA) from dinosaur fossils. In this study, we compare several methods of demineralization and DNA extraction to successfully isolate DNA that can be utilized for downstream applications like PCR or sequencing. Schweitzer's demineralization technique was used as the starting point, then modifications were added to balance the need for decontamination while minimizing DNA loss. These were followed by comparisons of extraction between salting out and the QIAamp DNA Investigator Kit (Qiagen) used on *Triceratops* fossils, sheep bone, and fresh mice bone. NanoDrop technology measured DNA purity and concentration, which showed equivalent results not correlated with bone age. The data from the extractions indicates the presence of DNA. Further testing with qPCR and gel electrophoresis suggests that the reference gene, β-actin, may be present in very low concentrations. Our next steps are to sequence the isolated DNA to compare its identity to known organisms and generate a genome assembly for the fossils. Successful isolation and sequencing of dinosaur fossils would force evolutionists to reevaluate the timeline of when dinosaurs lived, as well as provide sequences to compare to modern evolutionary phylogenetic trees, potentially causing major revisions to evolutionary thinking.

Michael Oard

Are Shoreline Terraces and the Bidahochi Formation Evidence for the Dam-Breach Model for the Grand Canyon?

Creation scientists have two models for the origin of the most iconic canyon in the world, the Grand Canyon. One is the dam-breach model, and the other is the late-Flood channelized erosion model.

Two seemingly fatal problems for the dam-breach model are the lack of shorelines and bottom sediments for the putative lakes. However, possible shorelines terraces capped by thin, patchy tufa have recently been found. The Bidahochi Formation continues to be presented as the bottom sediments of "Lake Hopi." The breaching of the Grand Canyon is currently seen as a rapid top-down process, starting with the breaching of a lake that formed the Black Canyon in western Colorado and ending with the erosion of the Grand Canyon.

Evidence from the field will be presented that the terraces have been misinterpreted. The terraces seem to be developed only on the Kaibab Limestone and not on other lithologies. This suggests some kind of bedding plane feature. Tufa has also been reported from the Kaibab Limestone at altitudes well above the height of "Lake Hopi." This tufa could be a seepage feature from the limestone, as suggested by Carol Hill for the tufa at Cape Solitude. Evidence will be presented that the Bidahochi Formation is not related to "Lake Hopi."

This research is important not only for the origin of the Grand Canyon, but also for the location of the upper Flood boundary, needed in a sophisticated Flood model.

Yolanda Pretorius

Proboscidea Does Not Equal the Elephant Holobaramin

Evolutionists claim that modern elephants evolved trunks and are descendants of much smaller basal Proboscideans such as *Moeritherium*, which presumably lived between 60 and 35 million years ago. However, modern elephants do not only have trunks and giant bodies, but also large brains, temporal glands, cushioned feet that can detect seismic vibrations, and the ability to communicate with infrasound. This literature study looks at the up-to-date claims made by secular science regarding the evolution of the Proboscidean order and how these claims are implausible when considering the need for multiple complex structures to have evolved simultaneously. Currently, phylogenetic trees are awkwardly arranged and grouped to support the gradual evolution of features such as cranial capacity instead of using the parsimony principle, which would have revealed the significant gap between the presumed early, proboscidean ancestors and more modern elephants.

I argue that the multiple, complex design elements making up the Elephantimorpha clade make it irreducibly complex. This is not only due to elephants' unique physical features but also due to the way in which these are interlinked to give rise to higher-level functions, such as a complex social stratification and structure (matriarchal

and hierarchical). These findings provide a valuable foundation for future studies aimed at defining the elephant holobaramin.

Jake Ramgren

A Survey of Contemporary Evolution in Nature and Its Implications to Creation Biology

Current creation models depend on rapid speciation to explain the biodiversity of life today. Darwinian mechanisms such as natural selection cannot account for so much speciation in the time between the worldwide Flood and the present. But this does not mean rapid speciation is impossible. In fact, many observational studies have shown rapid morphological changes in species occurring on contemporary timescales (years to decades), suggesting that rapid speciation is a widespread process (Stockwell et al.). Such rapid phenotypic evolution is required in a young-Earth model.

Despite the increase in attention given to rapid speciation, the mechanisms for it remain largely unknown. Therefore, to better understand how rapid speciation occurs, this paper will survey examples of contemporary (short-term) evolution and summarize what these observations suggest about rapid speciation. Special consideration will be given to vertebrates whose ancestors survived the Flood and dispersed across the globe in the post-Flood period.

This research found that birds, reptiles, fish, and other major animal groups display evidence of contemporary evolution. Further, these cases reflect potentially widespread mechanisms for phenotypic change on short timescales. Sensory drive, land colonization, hybridization, migratory ecotypes, and other ecological processes drive speciation in a variety of species. Many mechanisms likely play a role in rapid speciation. This survey of examples of contemporary evolution is an important first step in understanding how rapid speciation occurred in the post-Flood period.

Andrea Reitan, Carol Adams

Comparison of the Locomotor Biomechanics of *Homo sapiens* and *Australopithecus afarensis*

One of the main foci of paleoanthropological research is the supposed evolution of bipedality. Evolutionary naturalists face the tough task of explaining all the anatomical particulars that God created for humans to walk and run in the unique way that we do. Numerous studies have compared the human bipedal gait to that of extant apes, all under the assumption that humans and apes evolved from a common ancestor. *A. afarensis* is currently represented by the most complete skeletal remains among extinct apes and ape-like remains. This makes it the favorite for studying the supposed evolution of bipedalism. A few 3-dimensional muscle reconstruction models have been published in this regard. Some recent studies have acknowledged that *A. afarensis* would have walked with a gait different from humans but still assumed obligate bipedality. In this study, we explain how the lower extremity muscle and ligament attachments work with the osseous (bony) morphology to produce the human gait. Then we contrast this with how the anatomy of extant apes affects the way they walk. Finally, we compare these extant models with available data for *A. afarensis*. We conclude that its gait resembled that of modern apes. This result confronts the assumption of human evolution that pervades this field and conforms to the Biblical model of created kinds.

Rick Roberts

Teaching Young-Earth Origins Theory in Collegiate Classes: A Roundtable Discussion

While 'Research' is the middle name of the CRS, often the passion to pursue such research begins in a classroom where students are challenged to think about origins topics, and specifically about how these are viewed from a Biblical perspective. College science classes must include opportunities for students to explore origin theories, with an emphasis on appreciating the scientific and Biblical evidence supporting a young-Earth creation model (although this emphasis can be true of other classes as well). The hope is that some of the current college students will be intrigued by such discussions and that God will lead them to become the future of creation research. In this lunchtime discussion, ideas about engaging students in origins worldview analysis will be presented, and time will be allotted for discussion of other ideas from participants, such that those in attendance will leave with a variety of ideas on how to promote origin theory literacy, especially including the young-Earth perspective. Note: This lunchtime session is designed for educators (and those interested in education). Space is limited and will be available on a first-come, first-served basis.

Christopher Rupe

"Lucy" and the Pygmy Human Hypothesis

Generally speaking, there are two different views within the creation community with respect to the taxonomic identity of "Lucy" and her kind, *A. afarensis*. The first view posits that Lucy and her species were an extinct quadrupedal ape. Adherents of this view (Quadrupedal Ape Hypothesis) tend to overlook key diagnostic features indicating human-like obligate bipedality, which would contradict their position. Meanwhile, there is a growing number of creationists who recognize bipedal morphologies in the partial skeleton of Lucy and the broader *Australopithecus* genus. Proponents of this second view (Bipedal Ape Hypothesis) argue Lucy's kind had an ape-like cranium yet walked upright in a manner similar to modern humans. In this paper, several reputed "Australopithecus-like" traits are examined. Features commonly interpreted as indicators of arboreal propensities are found in small-bodied adult humans, such as the Flores "Hobbit" and *H. naledi*. Since these same traits occur in humans, they cannot be considered diagnostic of *Australopithecus* taxa. This paper further identifies features in Lucy's skeleton that are entirely consistent with *H. sapiens*. These findings call into question the taxonomic assignment of numerous human-looking fossils attributed to *Australopithecus.* Several lines of evidence support a new hypothesis (Pygmy Human Hypothesis), that Lucy was a genetically isolated small-bodied human, drawn from a pygmy population that lived in the Hadar region of East Africa during the post-Flood African Humid Period.

Frank Sherwin

Rapid Physiological Changes Within the Digenean Life Cycle Reflect Creation

The subclass/order Digenea is a group of flatworms within the phylum Platyhelminthes. The two-host life cycle is common in the class Trematoda (e.g., Schistosoma). During the life cycle, the parasite transitions into very different morphological forms: the egg, miracidia, sporocyst, redia, cercariae, metacercaria, and adult worms. As such, the parasite must immediately physiologically adapt to totally different environments as well as overcome two very dissimilar host immune system attacks, whether gastropod molluscs or vertebrates. These sophisticated changes cannot be the result of time, chance, and selection but instead reveal plan, purpose, and special creation. The physiological adjustments and genetic basis for the transformation processes are extensive, but have been little investigated. The result of literature searches reveals limited references to these critical transitions in the trematodes. Once the parasite successfully enters the host (mollusc or vertebrate), it must immediately address the targeted host responses. Rapid changes of abiotic factors could also compromise the worm's biology including temperature, pH, salinity, P02, PCO2, and the ambient osmotic pressure of fresh water. The environmental adjustments and immune evasion strategies are part of the worm's innate tracking system via regulated gene expression. The trematode is designed with multiple types of sensory receptors working together to rapidly affect physiological changes. I hypothesize that schistosomes continuously and actively track abiotic and biotic variables and swiftly respond by self-adjusting to these radically changing environments and host immunological responses. The worms are designed to utilize planned engineering principles, which result in adaptation and proliferation of the species.

Don Stenberg

Neutrinos and Accelerated Decay

Building on previous work, which indicated that not only Earth but also other planets and moons experienced accelerated nuclear decay (AND) and associated massive internal heating, this current work explores one possible cause of AND in depth, specifically high-energy supernova neutrinos from the Vela Supernova Remnant. Dozens of studies investigating a connection between neutrinos and decay are analyzed and summarized to provide an important background. In addition, the amount of expected beta decay based on our current understanding of neutrino-induced charged current interactions from Vela Supernova Remnant neutrinos is calculated. Several proposals are advanced on how these effects might have been increased. An argument for how neutrino-induced beta decay could also lead to other forms of decay, such as alpha and spontaneous fission, is discussed.

Brian Thomas

Cooking with Camarasaurus: How Ancient Temperature Affected Ancient Proteins

Collagen-rich regions of fresh bone matrix show birefringence under cross-polarized light microscopy (XPoL). In

bone nanostructure, collagen fibrils hold hydroxyapatite crystallites in a regular pattern that interacts with polarized light. Decaying collagen releases crystallites. This decreases birefringence. Our recent work found a collagen sequence in partly birefringent *Edmontosaurus* bone. This suggests that XPoL indeed reveals collagen. However, we observe that various bone fossils possess a spectrum of apparent collagen content that ranges from abundant to none. What causes such differences? To explore this question, we examined two disparate *Camarasaurus* specimens, both from the Brushy Basin Member of the Morrison Formation. One sample (CEM 0001) was excavated from a private ranch near Dinosaur, CO, and another (ICR 10002) from private property near Devils Tower, WY. CEM 0001 revealed pervasive birefringence, whereas ICR 10002 revealed none. We hypothesize thermal history as a primary driver of collagen loss. To evaluate this, we surveyed depositional settings and compared qualitative microscopic patterns between fossil and artificially (i.e., thermally) decayed bone collagen. A taphonomy wherein sustained, elevated temperatures accelerated collagen decay in the Wyoming sample but not the Colorado sample explains the results. However, given the relatively short half-life of collagen at any reasonable temperature, this option applies only if these dinosaurs were deposited thousands of years ago—for example, during Noah's Flood.

Jeff Tomkins

New Genomic Sequence Analysis Refuting the Alleged Human Chromosome 2 Fusion

The alleged end-to-end fusion of two small chimpanzee-like chromosomes to form human chromosome 2 (chr2) in a common ancestor of humans and chimps is a key argument for human evolution. However, the past ten years of research has revealed two paradigms refuting fusion: 1) the alleged 798-base fusion sequence is a transcription factor binding site inside the second promoter of a lncRNA gene (DDX11L2) that is involved in a variety of important gene networks, and 2) the alleged cryptic centromere is itself located in the middle of a large protein coding gene (ANKRD30BL) with the cryptic centromere sequence constituting/overlapping both exonic and intronic sequence. Despite these two discoveries and other pertinent data, there continues to be support for a fusion event amongst some creationists. Like evolutionists, they downplay the functional data and base their arguments solely on chromosomal synteny between humans and chimps. To resolve this debate, research has been initiated at ICR to analyze the human-chimp synteny surrounding these fusion-related features. Initial findings reveal that there is a significant collection of genes in the region near DDX11L2 and ANKRD30BL that are nowhere to be found on chimpanzee fusion-precursor chromosomes 12 (2A) or 13 (2b). Farther out from these regions, there are even more synteny-related discrepancies. Clearly, the structure of human chr2 in these regions is too complex and non-syntenic to be explained by a simple fusion event.

Cameron Ward – Future Leader

A Multiscale Analysis of Cosmic Voids Reveals How the Cosmos Was Engineered for Human Examination

We apply multiscale engineering methods from material science to the analysis of cosmic voids using the Cosmic Fabric Model and identify structures of the aether that are relatable to those of crystallographic grains. Whereas distant astronomical objects cannot be studied in a laboratory as earthly materials can, the relatable structures between cosmic voids and material grains illustrate the optimization of the universe for human examination so that the heavens might "declare the glory of God" (Psalms 19:1). Our analysis employs multiscale modeling of the aether that leverages bridging structures between length scales which characterize the structure-property relationships between galaxies, cosmic voids, and the large-scale structure of the universe. By applying the Cosmic Fabric Model and considering cosmic voids as large-scale granular structures in the aether, we postulate a model for cosmic structure that accounts for phenomena such as galactic morphology and orientation, "dark matter" distribution, void morphology and orientation, and possible indications of cosmic-scale kinematics. While this model renders astrophysical structures, its design and methods were derived from an engineering perspective of material science. The validity of applying a material model to cosmic structures is not only a case in favor of an aether, but it also suggests that the universe was designed by God for human research by making structures at unattainable distances relatable to earthly materials, which are readily studied. This comparison offers a perspective into astrophysical observation that suggests the universe is optimal for humanity to behold the greatness of an infinite God.

Notes from the Panorama of Science

Two Future Earth-Asteroid and Comet Impacts

Introduction

For the past decade, the public has been served a steady diet of information about NEAs, or near-Earth asteroids. Near-Earth asteroids (NEAs) are asteroids whose orbits intersect or come close to the Earth's orbit. They are a type of near-Earth object (NEO), which also includes comets. NEAs are categorized into different groups based on their orbital characteristics, including Amor, Apollo, Aten, and Atira, depending on their orbits (See Figure 1.). While most NEAs pose no immediate threat, some are classified as potentially hazardous asteroids (PHAs) due to their potential to approach Earth closely and possibly to strike it. For instance, NASA issued a warning about asteroid 2023 KU, a 370-foot-wide space rock traveling at over 64,000 km/h. It passed safely by the Earth on April 11, 2025, at a distance of 1,037,601 km. Its massive size raised concerns about a possible collision. Imperial College London states a 90-meter-diameter asteroid is estimated to impact Earth once every 10,000 years (https://impact.ese.ic.ac.uk/ImpactEarth/index.html). Such an impact would strike the surface of the Earth with 3.45 megatons. If it struck at a 45-degree angle, it would leave a crater with a diameter of 1.6 km and a depth of 342 m.

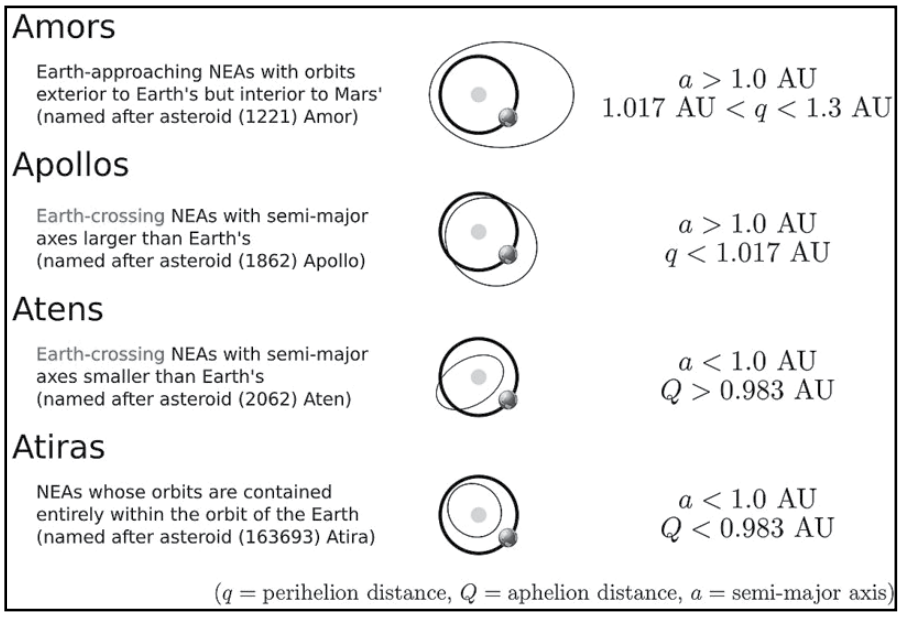


Figure 1. Near-Earth asteroid orbital characteristics. The symbol *a* is the semi-major axis in astronomical units. www.geolsoc.org.hk/pdf/seminar/Meteorite%20in%20picture.pdf.

Bible References

The Bible actually gives two possible instances of NEOs striking the Earth, possibly during a future period.[1] One, in Revelation 8, likely describes a large NEA, an asteroid striking an ocean on the Earth. This asteroid likely causes enormous waves called tsunamis (see Figure 2.).

> Revelation 8:8–9—"And the second angel sounded, and as it were a great mountain burning with fire was cast into the sea: and the third part of the sea became blood; And the third part of the creatures which were in the sea, and had life, died; and the third part of the ships were destroyed."

A parallel verse is found in Revelation 18:21—"And a mighty angel took up a stone like a great millstone, and cast it into the sea, saying, Thus, with violence shall that great city Babylon be thrown down, and shall be found no more at all."

Another NEO event follows as the object, Wormwood (meaning 'undrinkable' or 'bitter'), strikes a large inland lake region, such as the Caspian Sea, lying between Asia and Europe, or the Great Lakes on the US-Canada border. This is likely a comet[2] since it is described as having the

1 This article is based on the assumption that Revelation 8 refers to a future event as does Henry Morris in *The Revelation Record*. If it were a past event, the impact statistics still hold.

2 For instance, an asteroid is reclassified as a comet when, spectroscopically, it shows gaseous chemical emissions. The discharges are usually jet-like emissions

appearance of a burning lamp which poisons the "fountains" of waters on the Earth (Example: Comet Linear, Figure 3.).

> "And the third angel sounded, and there fell a great star from heaven, burning as it were a lamp, and it fell upon the third part of the rivers, and upon the fountains of waters; And the name of the star is called Wormwood: and the third part of the waters became wormwood; and many men died of the waters, because they were made bitter." Revelation 8:10–11

A comet has a bright star-like nucleus. It first appears as a star-like object which develops a somewhat fuzzy-appearing coma and later tails (one or more) as it approaches the Sun (See Figure 3.).

These events take place during the seven trumpet judgments in Revelation 8. In verse 7, "The first angel sounded, and there followed hail and fire mingled with blood, and they were cast upon the earth: and the third part of trees was burnt up, and all green grass was burnt up." Great fires burn a large portion of the Earth's vegetation. This reminds one of the extensive California fires of 2024–2025. The asteroid collision (verse 8) was the second angel judgment, and the third angel was the comet (verse 10). The fourth trumpet was the one-third dimming of the Sun's light and starlight (perhaps from thick atmospheric debris).

Figure 2. Asteroid-Earth collision, with resulting tsunami. Image: Don Davis via NASA Image and Video Library.

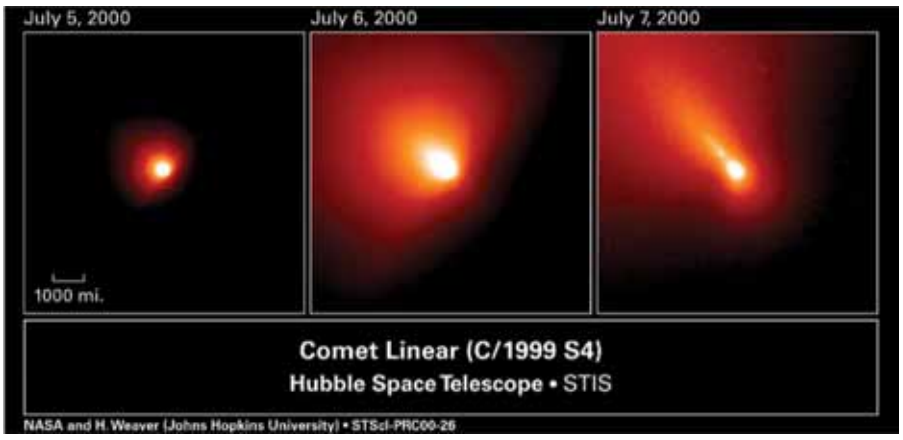


Figure 3. Comet Linear, as it approaches the Sun. It first appears star-like and later develops a coma and a tail. The last image may have the appearance of a "burning lamp" as stated in Scripture (HST image, NASA and H. Weaver, Johns Hopkins University).

Effects of Collisions

Since these are divine punishments of God for man's sin, the effects go beyond the effects of an asteroid and comet collision. The destruction of ocean-going ships (possibly docked) along the shorelines undoubtedly followed from the eruption of *tsunamis* as they grow outwards from the asteroid impact and consequent earthquakes. But the effects include a third part of the oceans becoming blood. The statement does not say the sea became fully blood but only a third of the oceans do this, and the next verse states that a third of the sea animals died, so their death could have resulted in much of this. God's judgments on Egypt in Exodus 7:17 included the fresh waters becoming blood, so a miraculous cre-

from exposed surface ices. Many of the chemicals are poisonous (Figure 4).

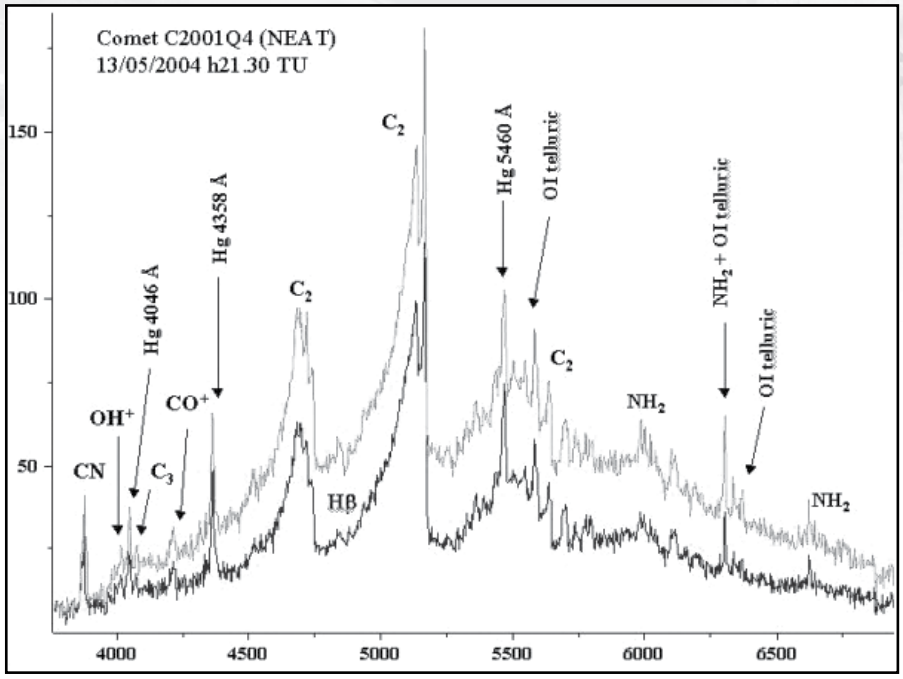


Figure 4. Comet 2001 Q4 (NEAT). In this image is shown the spectrum of comet 2001 Q4 taken on May 13th 2004. Its distance from earth was 0.4 Astronomical Units). Astronomical Society, G. Schiaparelli (unpublished).

et collision since comets are known to have many noxious chemicals: carbon monoxide, methane, ammonia, and dozens of other poisonous chemicals including ethanol, hydrogen cyanide, isocyanic acid, formaldehyde, etc. (Biver et al., 2024).

So, we know (if the verses refer to things to come), that there will be two actual and future NEO collisions with Earth. However, the dates of the collisions are unknown except that they will be in the last times. Revelation 22:20—"He which testifieth these things saith, Surely I come quickly. Amen. Even so, come, Lord Jesus."

Ronald G. Samec, PhD.,
Retired
Former Professor,
Bob Jones University
Professional Astronomer

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Biver, N., et al. 2024. Chemical composition of comets C/2021 A1 (Leonard) and C/2022 E3 (ZTF) from radio spectroscopy and the abundance of HCOOH and HNCO. *Astronomy & Astrophysics* 690: A271, 29 pp.

Morris, H. 1983. *The Revelation Record*. Tyndale House Publishers, Wheaton, IL.

ation of blood cannot be rejected, as Morris (1983) hints.[3]

The actual poisoning of the fresh water supply would result from a com-

3 For instance, Dr. Morris states that "blood" (his quotes) may be like the "red tide," a harmful sudden and excessive growth of microscopic algae in the water. These algal blooms can be toxic and harmful to marine life, humans, and other animals. The algae can discolor the water, often turning it reddish-brown. He also states that the phenomenon is more likely chemically "blood red water," p. 147 The Revelation Record. (It is known that Morris's book uses physically known phenomena to explain apparent miraculous events.)

Math Refutes Materialism

Harkening back to the molecular biological revolution of the 1950s, James Watson and Francis Crick elucidated the structure of the DNA molecule in 1953. They discovered that it has a beautiful helix structure and possesses four chemical subunits called nucleotide bases that run along the interior of the helix (Watson and Crick, 1953). In 1957 and 1958, Crick, who had acted as a code breaker in World War II, posited what is known as the *sequence hypothesis*. In a breakthrough moment in the history of biology, he realized that the nucleotide bases on the inside of the double helix function like alphabetic characters in a written language or what we now think of as the zeros and ones in a section of software code (Crick, 1958). This means that it is not the physical or chemical properties of

those bases that are important to their function, but rather their sequential arrangement in accordance with an independent code. This code was eventually interpreted and is now called the genetic code. Thus, DNA is essentially an information-bearing system that expresses information for building the proteins and protein machines that cells need to stay alive.

In industry today, there exist information companies such as Microsoft that write code and Boeing and other manufacturing companies that use code. In a process called computer-assisted design and manufacturing (CAD/CAM), an engineer writes code that is then carried along a wire and converted into another machine language that can be read by a manufacturing apparatus, which then directs the construction of a mechanical system. At Boeing, for instance, code might be used to place rivets in exactly the right spot on an airplane wing. The same sequence of events occurs on the inside of a living cell—there is information directing the construction of proteins and protein machines that are absolutely necessary for survivability. Thus, the major question is, where does that information come from, and what kind of information is it? This is where *information theory* comes in. In the late 1940s, Claude Shannon developed a mathematical theory of information that had to do with the reduction of uncertainty. Shannon showed that the reduction of uncertainty is inversely related to probability, and it is said that the more improbable an arrangement of characters, the more *Shannon information* it carries (Shannon, 1948). However, Shannon's notion of information did not capture the notion of meaning or communication function. A series of characters that are basically gibberish could have a high Shannon information measure because the characters are aperiodic and random, but this does not indicate that the sequence is meaningful. In other words, Shannon did not capture the difference between functional or meaningful information and the improbable arrangement of characters. Thus, it is not only information theory but information theory plus a qualitative judgment about what a sequence is doing that allows humans to recognize the kind of information that we are familiar with within our own parlance: variable sequences of characters for conveying meaning or functions, such as words in a dictionary. The sequences in DNA also convey meaning, which Crick clearly conveyed from the beginning. He said the information in DNA is not mere Shannon information; it is information that is functional, and that is the kind of information that always indicates the prior activity of an intelligence. If a sequence is just a random arrangement, then it might be the product of an undirected process, but if it is very specific and complex and operates in accord with specific conventions, this indicates that it is the product of a mind (Meyer, 2014, pp. 164–168).

Regarding the information string in DNA, the evolutionary contention is that if one runs the proverbial "experiment" enough times, eventually, one will end up with evolution that, combined with natural selection, preserves the mutations that are beneficial, and one will end up with something that looks designed even though it is not designed. In other words, mutations over time preserved by natural selection are enough to produce DNA as we know it (Dawkins, 2006). However, there is a mathematical problem with this notion, and it is a profound one. David Berlinsky, an American mathematician and philosopher, calls it the *combinatorial problem* or *the problem of combinatorial inflation* (Berlinksi, 1996). Engineers know from experience writing and using software code that the last thing one wants in a section of functional software code is a series of random changes to zeros and ones. If that happens, the information will be degraded that is in that code long before you will ever generate a new software program or operating system. Richard Dawkins, a British evolutionary biologist, author, and outspoken atheist, among many other biologists, has acknowledged that what we have in DNA is akin to machine code or, as Leroy Hood, an American biologist, calls it, digital code (Dawkins, 1995). It functions in exactly the same way. Thus, what has been learned from software writing and using is highly relevant to understanding whether or not the mutation-selection mechanism could realistically generate new information. There is a reason that changing software at random invariably degrades the information before anything useful or new is achieved. That is because there are so many more ways to create errors in any system of digital, typographic, or alphabetic communication—there are vastly more ways of arranging the available characters that will generate gibberish than there are ways of arranging those same characters that will generate something functional. So, if someone starts randomly changing things, they are overwhelmingly more likely to create a gibberish sequence than a functional one. Researchers have actually tried to quantify how much more likely, and the quantitative odds are prohibitive. Douglas Axe, an American biologist and author, worked for 14 years at Cambridge University to try to quantify the question of how rare or common the functional sequences are that would make a new gene capable of making a new protein—that is, how rare functional combinations are in comparison to non-functional ones. He discovered that for a relatively short protein—about 150 amino acids long—the ratio of functional to non-functional sequences was about 1 over 10 to the 77^{th} power (or 10^{-77}). To put that in

context, there are only 10 to the 67th (or 10^{65}) atoms in the Milky Way galaxy. This means that a random search for a new functional sequence is like looking for one marked atom among 1 trillion galaxies the size of the Milky Way. It turns out that even if four billion years of life history existed, that is not enough time to solve a search problem of that magnitude. The bottom line is that it is overwhelmingly more probable that such a search would fail than succeed in the known time of life on planet Earth, which means that the hypothesis that the mechanism can produce new information is far more likely to be false than true (Meyer, 2014, pp. 155–184).

All this indicates is that it is far more likely that the formation of DNA was designed than randomly achieved. This is reflected in the fact that there appear to be jumps in the fossil record—it is not a continuous process of mutation upon mutation, building one on the other randomly. An example of a "jump" is the Cambrian explosion, when a diverse array of animal life forms appeared quite suddenly in the fossil record, characterized by rapid diversification, complex body plans, and ecological innovation (Statham, 2017). Evolution becomes a major engineering problem because it is not just that there are gaps in the fossil record; one has to ask how the evolutionary process would produce all of the new information necessary to build completely new body plans, new cell types, and new anatomical structures. It would take much new information. Then one has to look to see if there is enough time to do that, do you have enough trials through this mechanism, and so on. The answer is, overwhelmingly, no! It is not plausible at all mathematically. However, we do know of a cause that is sufficient to produce new information—the God of the Bible, not a "god of the gaps" or "an argument from ignorance." Per Darwin's historical scientific method, when one is trying to explain an event in the remote past, one wants to draw on their knowledge of cause and effect: what kind of cause has been observed that is capable of producing the effect in question? If the effect is the generation of much new digital information, we know of a cause that can do that. It is a mind or an intelligence. It happens that this is the only known cause that can produce much new information, and it is certainly much more plausible than the Darwinian idea of a random search (Meyer, 2014, pp. 382–403).

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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.*

Some Additional Thoughts on Time

Paul's inspired treatment of time in his letter to the Romans gives support to my views presented in a previous letter [*CRSQ* 60:216–217 (2024)]. In Romans 3:25, he tells us, "Whom (Christ Jesus) God hath set forth to be a propitiation through faith in his blood, to declare his righteousness for the remission of sins that are past, through the forbearance of God…." Are only past sins forgiven? What about future sins? They cannot be forgiven because they do not exist. There is no record of them in heaven. As soon as sins are committed, they become past sins and are in need of forgiveness, which God is able to provide for the repentant transgressor.

Also, in Romans 8:38–39 Paul declares that he is "…persuaded that neither…things present, nor things to come…shall be able to separate us from the love of God, which is in Christ Jesus our Lord." Why did he not mention things in the past? Can they separate us from God's love? There is no reason to even consider such a possibility because they do not exist. The past no longer exists because it has become the present. The things of the past became the things of the present.

In my previous letter, I stated that time is a relationship between matter in space and energy. This can be illustrated by an analogy. Density is not a fundamental aspect of the universe. God did not create density. It is a relationship between matter and space—two fundamental aspects of God's creation (Genesis 1:1). Yet density is very real, but it can only be determined by measuring mass and volume. In a similar way, I believe that time is not a measurable fundamental aspect of God's creation. Time began "in the beginning" when God created matter, space, and energy, and can only be determined by measuring distance (based on a difference of location in space) and speed (dependent on energy acting on matter). We measure distance by using a standard for comparison, and we can also measure speed by using a standard for comparison. In general, if two objects travel the same distance, starting together, from point A to point B, but one arrives at point B first, we say that it took less time. Why? Because it had greater speed. We commonly measure speed in units of distance and time. But any units of time we use can be defined as a relationship of speed to distance (e.g., the speed at which a clock's hand travels the distance between numbers can be used as a standard of time; or for an atomic clock, the number of vibrations, dependent on speed, a cesium atom makes within a certain distance can also be used as a standard of time). So, according to the SI (metric) system, distance and time are base (fundamental) units, and speed is a derived unit (based on distance and time). But I believe that, according to the Bible, distance and speed are fundamental units (based on space and energy), and time is a derived unit (based on distance and speed).

I now respond to Drake's question about how my position regarding time allows for free will. In considering human free will, we enter into the spiritual realm, as opposed to matter, space, and energy. However, I regard our omniscient God as having not only intimate knowledge of every sub-atomic particle at every nanosecond, but that He is also intimately and continually aware of our spiritual condition and therefore knows and has eternally known how we will respond to every situation, both to physical and spiritual (including His) influences. This also relates to the origin of every distinct person. Here, we are not just dealing with the genetics of our physical bodies (physical genes inherited from our parents, which determine our physical traits), but with our individual spiritual origins. I personally favor the Traducian Theory. But how the nature of our souls was influenced by those of our ancestors is not a topic that we can study scientifically, so we must turn to the Scriptures. According to the Scriptures, God has predestined His people (Ephesians 1:5, 11). But, according to Romans 8:29 and I Peter 1:2, our predestination and election are based on His foreknowledge. Before He formed me in the womb, He knew me (Jeremiah 1:5). He knew me before I existed, before I was even conceived. This is due to His amazing foreknowledge. Before God created anything, He knew every detail about every thing that would ever come into existence;

not just physical attributes, but spiritual attributes, as well. He knew how each of us would act and react, and interact in every circumstance.

I do not wish to enter into the free will vs. predestination controversy. I believe all the scriptures used to support each side. I realize that leads to seeming contradictions. How to reconcile those contradictions is a mystery. There are seeming contradictions in the doctrine of the Trinity, but most Christians believe it anyway. Since in the New Testament, Jesus and the apostles do not speak against either side of the issue, I believe we would be wise to do likewise. I Corinthians 2:7 tells us, "But we speak the wisdom of God in a mystery, even the hidden wisdom, which God ordained before the world unto our glory." The Greek word for "ordained" is elsewhere translated as "predestinate." So, it is a mystery. Our finite minds cannot understand it. But we preach the gospel, teach the Bible, and hopefully avoid striving with one another. We need to be in unity (I Corinthians 1:10), that the world may believe that God sent Jesus (John 17:21).

Arthur Manning
Vineland, NJ

Response To Manning

I want to thank Mr. Manning for pointing out that the common estimate for the number of cells in the body includes red blood cells (RBCs) which account for about 84% of all the cells in the body and which lose their DNA early in their development. On the other hand, muscle cells are multinucleate so they raise the estimate slightly. The correct number to use is not the number of cells in the body but the number of nuclei in the body. A current estimate is about 6 trillion nuclei in a typical human body. This is about one-sixth of the estimate presented in the paper so the numbers in the calculations need to be divided by about six. I had stated that 1.3 billion cells will experience some type of mutation event caused by C14 in a lifetime, and about 10 thousand will experience a mutation in p53, one of the most important genes that prevents cancer. The recalculated numbers would be "about 200 million cells will experience some type of mutation event caused by C14 in a lifetime, and about 1,600 will experience a mutation in the p53 anticancer gene." This is still a very large number of mutations caused by C14. It is noteworthy that the multiple hit theory of cancer means that the incidence of cancer should follow a power curve with time. It would be interesting to plot the incidence of cancer by age to a power curve to see how well it fits this theory. Also, worldwide, about 25% of the population will experience some type of cancer during their lifetime and about 14.6% will die of cancer. If aging is a way to prevent cancer, this means that aging only has to keep 75% to 85% of the population from dying of cancer to be beneficial.

Raul E. Lopez, Jr., MD

Bergman v. Faulkner Exchange

I write this letter to express my sadness and discouragement over the exchange between Dr. Bergman and Dr. Faulkner, *Creation Research Society Quarterly* (Volume 62:69-73).

My family and I contribute to six creation ministries, and I have been participating in the YEC science movement for 35 years. Young-Earth creation science is key to my witness to my family (especially my son), friends, church members, and others.

The exchange between Mr. Bergman and Mr. Faulkner is not new in the pages of creationist science magazines. Specifically, within the last five or so years, I have seen an increase in articles (from various disciplines and various ministries) displaying a judgmental or denigrating tone when addressing or replying to criticism.

Coupling this trend with the bad news that the YEC view of science is working its way to an all-time low of 15% by 2050, you can see the reason for my sadness.

But I am hopeful: First, because we are redeemed sinners, and second, because of the quality of professionals I believe in. I hope that creation scientists and creation ministry leaders can combine both letters and produce a 'laundry list' of areas in the methodology of 'how' creation scientists do science that need to be corrected.

A most important task that must be overseen by St. Peter's prayer for the early church: "Finally, all of you, have unity of mind, sympathy, brotherly love, a tender heart, and a humble mind" (1 Peter 3:8).

Thank you for reading this, and may God bless you all.

Jorge A. Velez
Long Beach, CA

A Suggested Mnemonic Device for Creationism

The central idea of this paper is that there are only two options for explaining "how everything got here": *Special Creation* or *Naturalistic Evolution*. The mnemonic device proposed here is intended to show that evolution is neither plausible nor possible.

I suggest the image of a Christian cross standing upright in a clump of rocks as the mnemonic device.

- The *rocks* represent 'Natural Laws.'
- The *horizontal beam* represents 'Time.'
- The *vertical beam* represents the proposed evolutionary 'Process.'

Focusing on what is widely acknowledged, there are three main components of evolution:

1. Natural Laws
2. Long Ages (often referred to as "deep time")
3. Mutation and Natural Selection (sometimes referred to only as Natural Selection)

Succinctly stated, the concept of evolution is that, over millions of years, mutation and natural selection—operating under nothing more than the natural laws of the universe—produced all living organisms we see today.

This mnemonic device illustrates that:

1. Natural Laws themselves preclude an evolutionary origin of the universe.
2. Time is the enemy of evolutionary concepts.
3. Evolution has no demonstrated process capable of producing what it claims.

It is designed to serve both as an "elevator speech" (a 3-minute explanation of why evolution is false) and as a framework for organizing the many supporting arguments that refute evolution.

The Basic Elevator Speech

1. The Rocks — Natural Laws

Imagine a pile of rocks representing Natural Laws. These laws actually oppose evolutionary concepts:

- Energy cannot be created or destroyed (so where did it come from?).
- Life only comes from preexisting life (so where did the first cell come from?).
- Random chance cannot produce information, a finely tuned universe, or explain the origin of logic, love, or morality.

2. The Horizontal Beam — Time

Next, imagine a horizontal beam

representing Time: "Time flies like an arrow" (and as Groucho Marx joked, "fruit flies like a banana").

- On one hand, there is not nearly enough time in the proposed 13.8 billion years of the universe's age to randomly assemble even a single functioning protein. Probability calculations show the time required is on the order of 10^{160} years. Yet life requires many proteins, along with RNA and DNA, to exist simultaneously. Simply stated: *There isn't enough time available.*
- On the other hand, radiocarbon (C-14) has been detected in dinosaur soft tissue (supposedly ~65 million years old), Paleozoic coal (~300 million years old), and diamonds (~1 billion years old). Because C-14 decays within ~100,000 years, these findings suggest that *the time available isn't enough*.

3. The Vertical Beam — Process

Finally, imagine the vertical beam representing living things increasing in complexity—the standard "tree of life" or macroevolution. This model proposes that a single-celled organism gradually acquired new features (e.g., multicellularity, eyes, fins) through mutation and natural selection.

- However, mutation does not create novel features; it merely degrades existing ones (such as disabling insect wings or breaking a bacterial nutrient pump).
- Natural selection involves survival of the fittest, not the *arrival* of the fittest. It does not explain how fully integrated survival features originated.
- In short, *evolution has no scientifically demonstrated mechanism to explain the origin of complex biological structures*.

The Cross as a Reminder

What remains is a cross anchored by rocks at its base. This image points us to the Cross of Jesus Christ, who claims to be the Creator God and the first cause of time, space, matter, energy, information, life, and non-material realities such as logic, love, and morality.

Using the Device as a Framework

This mnemonic can also categorize other supporting arguments that fit into the three areas of Natural Laws, Time, and Process:

- **Natural Law:** "Nothing" cannot produce something; the universe had a beginning (cosmological argument); fine-tuning of the universe; random chance cannot produce information; extreme complexity of molecular machines (e.g., kinesin, ATP synthase, bacterial flagellar motor); origin of life problems; inability of materialism to explain non-material realities such as beauty, love, logic, and morality.
- **Time (Horizontal Beam):** Geological evidence (folded layers without erosion, fossil formation, polystrate fossils, flood-related mass extinction, megasequences); dinosaur soft tissue; radiometric dating issues; Earth's magnetic field decay; lunar recession; erosion rates; ocean salinity; catastrophic plate tectonics.
- **Process (Vertical Beam):** Mendelian genetics; genetic entropy; mutations; myth of junk DNA; human-chimp DNA comparisons; fossil record issues (missing transitions, Cambrian explosion, stasis, "living fossils," out-of-place fossils); biological design (constant environmental tracking, insect leg gears, trilobite eyes).

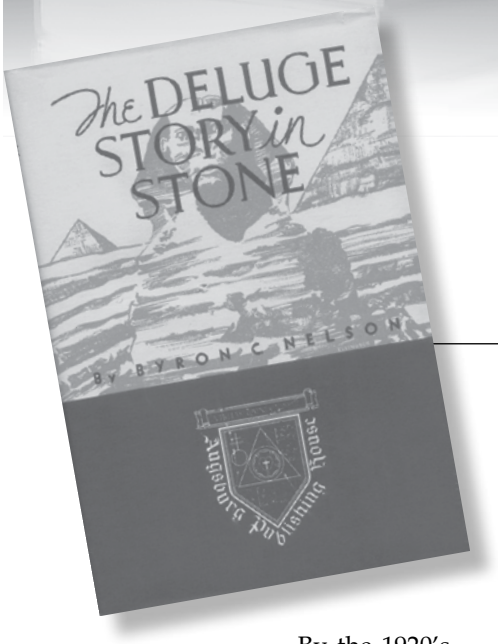
This mnemonic device thus serves as both a concise teaching tool and a structural outline for the many evidences supporting creationism over evolutionism.

John Curtis

Notes:

https://www.str.org/w/building-a-protein-by-chance.

Media Reviews



The Deluge Story in Stone

by Byron C. Nelson

Augsburg Publishing House, Minneapolis, 1931, 190 pages, Out of print.

By the 1920's secularism had taken over universities worldwide. It was not until after his formal education that Byron Nelson (1912–2006) heard about a Flood theory that could explain the earth's strata. After years of studying a fossiliferous stratum of the Rocky Mountains in Alberta, he was convinced that the Deluge offered a better explanation for both the strata and fossils contained therein. Nelson studied the literature of early scientists and was surprised to discover that for centuries the Deluge was the commonly accepted theory among geologists.

The Deluge Story in Stone is a classic summary of his studies. Beginning with Philo in 15 B.C. and Tertullian in 155 A.D., Nelson traces the history of Deluge theory, giving both a summary of the original writings and showing the geological evidence for these writings. This short, easy to read book gives an excellent overview of the major geologists, along with detailed descriptions of the evidence for the Global Flood.

One of the early scientists Nelson gives attention to is Steno (1638–1686), known not only for anatomy discoveries but also detailed geological observations and deductions. During the mid-1600s, Steno studied the strata and fossils of Italy. He deduced that the strata was deposited by water and the fossils within were generally sorted due to gravity.

John Woodward, a close friend of Isaac Newton, is one of the British scientists Nelson describes. While Newton studied astronomy, Woodward considered the strata and fossils of England. He wrote *An Essay Toward a Natural Theory of the Earth* (1695) in which he proposes that the solid rock of the preflood earth was dissolved in the flood waters. The process is not as salt dissolves in water, but Woodward means the rock became sand and mud. This assumption is based on the amount of sediment needed to form the earth's strata.

Nelson moves on to summarize challenges to Flood theory and how those objections are answered. Nelson discusses mountain formation, erosion and coalbeds. The mid-1800s saw a shift in society's view of God, leading to the search for natural explanations..

As Nelson moves on to the mid-1800s and the introduction of uniformitarianism, he gives a detailed summary of both the theory and the geologists promoting and opposing it. The final geologist Nelson refers to is Henry Howorth. Unlike contemporaries, Howorth was not a believer in the Bible as the Word of God, calling it Hebrew tradition. Aside from biblical thinking, Howorth's aim was to disprove the theory of uniformity. He assumed a catastrophic flood because of flood traditions from around the world. Where could such traditions come from, he reasoned, if not based on ancestral experience. Howorth wrote *The Mammoth and the Flood* (1887) as a counter to uniformitarianism. Author Nelson explains how Howorth used original firsthand accounts when gathering descriptions of the vast graveyards including the writings of: Pallas, a Siberian exile, explorer F. Wrangell, and P. J. Strahlenberg. These men reported not just scattered graveyards, but bone-filled strata on every Arctic island and along the bank of every river. The small northern Island of Lavikov was said to consist mainly of fossil bones. Not just elephant bones, but horse, sheep, rhinoceros, and even camel bones are found in the Arctic.

Nelson ends the book with an appendix containing a comparison and

overview of 40 flood traditions from around the world. Although Nelson's writing is nearly 100 years old, the vast amount of detailed geological descriptions made by early field geologist is not outdated. These explorers brought science out of the superstition of the dark ages. Most of them started with the truth of the Bible and then looked at the rock record and saw the perfect match. The tracing of the changing thought as civilization moved from superstition to Biblical thinking, and then to secularism, makes for an informative read.

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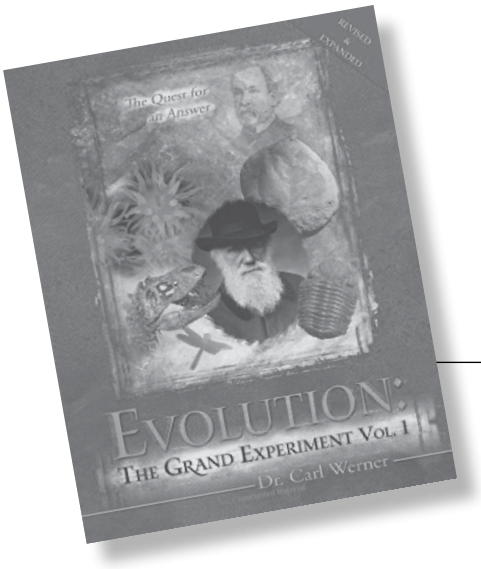

Evolution: The Grand Experiment Series

by Carl Werner

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Human Evolution Now Has Been Effectively Buried

One of my main interests for the last four decades has been evaluating the evidence for human evolution from some non-human creature. I am one of the few creationists who has focused on this area. I have published 27 peer-reviewed articles and two books covering this topic (Bergman et al., 2020). For the last decade, I have been somewhat overwhelmed in my attempt to completely cover this field. It requires someone full-time to adequately do it justice. This is where Dr. Carl Werner comes in. He has dedicated the past 25 years focusing largely on human evolution. When I compare his work with mine, it is clear that I have managed to cover only a small fraction compared to what he has achieved. Accompanied by his wife, an accomplished photographer, he has photographed hundreds of original ape-man fossils and filmed the dig sites where they were discovered. The Werners also conducted detailed interviews with 43 of the leading experts working in the field of human evolution on five continents (including Donald Johanson, Yves Coppens, Ian Tattersall, F. Clark Howell, Robert Broom, Ron Clark, Michel Brunet, Daniel Lieberman, Charles Oxnard, Kamoya Kimeu, Milford Wolpoff). When interviewing the scientists, the author, holding degrees in biology and medicine, never revealed that he was questioning human evolution and looking for evidence to conclusively validate or disprove the theory.

The author, Carl Werner, graduated summa cum laude from the University of Missouri with distinction in biology. He then received his doctoral degree in medicine at age 23 and practiced emergency medicine in St. Louis until he retired to work full-time researching the claims of human evolution.

In his sophomore year of college, Werner, then an evolutionist, was challenged by a fellow classmate to prove evolution. Disturbed by his classmate's criticisms of Darwinism, he began his quest for an answer. Driven by his stringent scientific background and curious nature, Dr. Werner read and researched every evolutionary claim, especially those in paleontology, geology, biology, and biochemistry. Over the next nearly three decades, from 1997 to the present, Dr. Werner traveled over 300,000 miles to museums and dig sites around the globe, photographing thousands of original fossils and the actual fossil layers where they were found (Batten, 2011). After 18 years of study (1979–1997), Dr. Werner began a series of experiments to test the validity of evolution; thus began what he called his 'Grand Experiment' to determine its veracity.

The Response of Critics to His Work

An internet search on Werner and his project turned up nothing, very rare for an out-of-the-closet creationist. Being largely ignored allows him to involve himself in his research with fewer problems than normal for creationists. One reason for this could be that none of his five major books, nor the many articles about him in creation journals, mention his personal religious beliefs. Although most of the websites that cover his work are sponsored by creationists, he avoids Biblical terms, such as "kind," using the term "type" instead.

Werner's apparent escape from critical scrutiny among his evolutionary peers is unusual because even articles that ignore the implications of falsifying evolution are likely to be called out. An article in *Science* by Swedish Lund University professor Kurland et al., titled "Genomics and the Irreducible Nature of Eukaryote Cells," made it past the sensors, being published, though later attacked. For example, University of Düsseldorf botany professor William Martin et al. wrote in response to Kurland's article that "most disturbing, if contemporary eukaryote cells are truly of an 'irreducible nature' as Kurland et al.'s title declares, then no stepwise evolutionary process could have possibly brought about their origin, and processes other than evolution must be invoked. Is there a hidden message in their paper?"

One reason Werner is ignored in the evolutionary literature is that his work is carefully documented by both photographs and videos as well as personal interviews of evolutionists. Werner's work is often ignored because the book is not light reading and requires some background in the subject. Reading all five volumes, a few pages a day, will convince all but the stalwart evolutionist to realize that the case for human evolution is bankrupt. The 433 pages of Volume 5 (in small print on 8.5 x 11-inch paper) features 2,600 references, including those published in French, German, Spanish, and Dutch.

Of the five volumes, I will review only volumes 3, 4, and 5. Volumes 3 and 4 cover my main interest, frauds that have plagued human evolution since before Darwin, and some of the most famous claims of so-called missing links. His travel and research have documented in detail more than 150 frauds committed by scientists working in the human evolution academic area, using photographs and quotations from acknowledged experts. Some of the better-known examples spread out over Volumes 3 and 4 are Piltdown Man, Nebraska Man, Lucy, the Taung Child, and the Orce Ape-Man.

Most of the cases covered in Volume 4 are an embarrassment for evolutionists today, although some are still held by some leading evolutionists. Along with Piltdown Man, one of the most infamous cases of forgery, over 100 other cases are covered as well. I have been researching this human evolution problem for several decades, but I was unaware of close to a third of the cases Werner presents. Some examples include the following:

- Claims that modern humans evolved from Black Africans, Native American Indians, Aboriginal Australians, Chinese, Mongolians, Papua New Guineans, India Indians, Inuit (Eskimos) (pp. 4–12), Aboriginal Sri Lankans, South American Aboriginal Fuegians, Andaman Islanders, Polynesian Islanders, and Jews
- Other ape-men that were created from relatively recently buried humans—one reason this occurs is because of a lack of understanding that, under certain conditions, fossilization can occur in a fairly short period of time. One well-documented case in the literature was Boskop Man (pp. 13–24).
- Ape-men created as a result of paleoanthropologists altering fossils (pp. 29–89)
- Forty-one different species of ape-men, all of which further study has confirmed were Neanderthals (p. 43)
- The Handy Man (*Homo habilis*) forgery is also covered in detail (pp. 54–74).
- Scores of other lesser-known cases of fraud or wrong identification are also covered, 237 in all (pp. 222–228).

Summary

The *Human Evolution: The Grand Experiment* series carefully documents

in great detail the fact that all of the fossil ape-man evolutionary claims, such as Lucy, are not ape-men but either fully human or some extinct primate. Dr. Werner reproduces, often by photocopy, from the evolutionary literature the past claims made and, relying on the latest published academic research, proves the claims are without foundation. To achieve this, he references current peer-reviewed, academic literature, illustrating my conclusion that human evolution will be disproved, not by creationists, but by evolutionists in the peer-reviewed scientific literature. The 2,600 references comprising 433 pages, which required a separate volume, Volume 5, and thousands of color pictures, review the claimed 237 species of overturned ape-men. The interviews with the leading evolutionists alone are worth the price of the book. If the author is wrong on any of his claims, evolutionists will be actively publishing the evolutionists' claims in evolutionary literature. So far, the silence is golden…*and deafening*.

Jerry R. Bergman, Ph.D.

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Thrapp, D.L. 1950. Early "missing links" from Africa. *Natural History* 59:306.

Instructions to Authors

Submission

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

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

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

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

Appearance

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

Submitted manuscripts should have the following organizational format:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Special Sections

Letters to the Editor:

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

Editor's Forum:

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

Book Reviews:

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

Author Copies:

CRSQ policy is that authors get 10 free copies of the issue containing their article, regardless of the number of co-authors. These free copies must be pre-ordered before the issue goes to press.

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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.

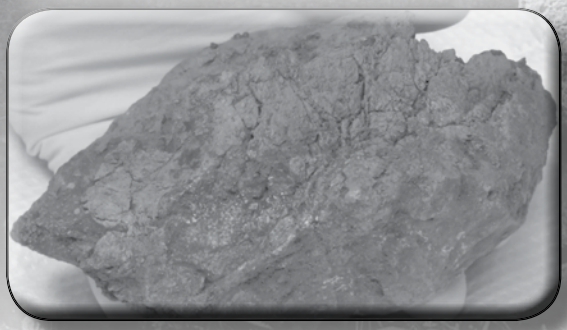
Membership—Voting membership is limited to scientists who have at least an earned graduate degree in a natural or applied science and subscribe to the Statement of Belief. Sustaining membership is available for those who do not meet the academic criterion for voting membership, but do subscribe to the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

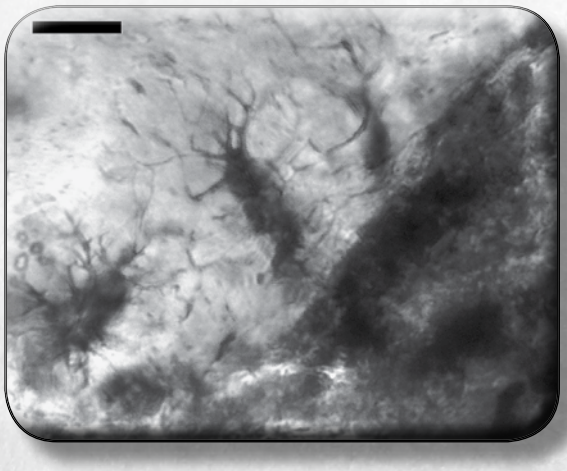
1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.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

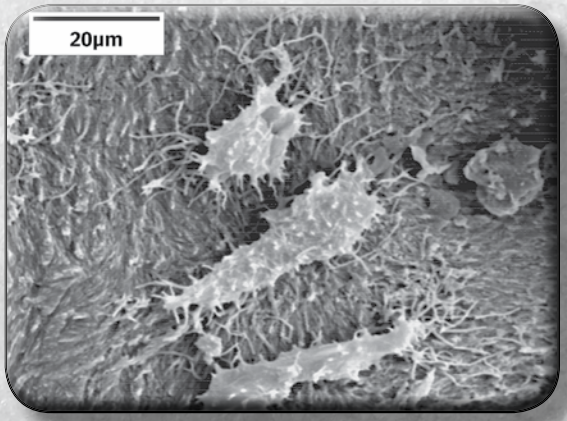
Investigation of Dinosaur Intact Natural Osteo-tissue



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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