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- THE PROBLEM OF AMPHIBIAN ORIGINS
- THE UINTA MOUNTAINS AND THE FLOOD: GEOMORPHOLOGY
- ASTRONOMICAL ASPECTS OF THE HYDROPLATE THEORY
- FORMIC ACID IN THE MILLER-UREY EXPERIMENT



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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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The Uinta Mountains and the Flood

Part II. Geomorphology

Michael J. Oard*

Abstract

During the late stages of the Flood, uplift and erosion of the Uinta Mountains created planation surfaces. The highest is the Wild Mountain upland surface. A lower broad pediment, the Gilbert Peak erosion surface, is seen as erosional remnants on the north, east, and south sides of the mountains and is best observed on the north side. Later significant erosion of the uplifted core created the Bishop Conglomerate, a formation of large quartzite boulders covering much of the Gilbert Peak erosion surface. Afterwards, the Gilbert Peak surface was dissected and many water gaps were cut, providing courses for the Green and Yampa Rivers. The final geomorphic event in the Uintas was post-Flood glaciation. Thus, most major geomorphological features found in the Uinta Mountains are readily explained by the recessive stage of the Flood. Implications of this interpretation include: (1) a very late Cenozoic post-Flood boundary in this region, and (2) Flood, not post-Flood, deposition of the Green River Formation.

Introduction

Geomorphology offers much evidence of the Flood. Features inexplicable to uniformitarians are readily explained by the Flood's recessional stage (Walker, 1994) and its two phases: (1) the abative phase, or sheet-flow phase, when wide currents were flowing off the continents, and (2) the dispersive phase, or channelized-flow phase, when currents became narrow and were forced to channel around mountains and plateaus as the

continents continued uplifting (Figure 1). Flood recession eroded thousands of feet of rock (Figure 2) and created dramatic landforms, including erosional escarpments, planation surfaces, pediments, erosional remnants, lag deposits of resistant cobbles and boulders, the vast continental margin sedimentary aprons, and their incised submarine canyons (Oard, 2008a). These features are difficult if not impossible to reconcile with the theories of secular geology.

One area that illustrates this diluvial geomorphology is the Uinta Mountains. The geology of the area is best explained by Flood processes (Oard, 2012), and its landforms are best explained by Flood runoff. The timing of these features constrains the post-Flood boundary and consequently places the deposition of the controversial Green River Formation during the Flood, not afterwards (Oard and Klevberg, 2008).

Large Erosional Event

The Uinta Mountains of northeast Utah and northwest Colorado (Figure 3) run east-west for 125 miles (200 km)

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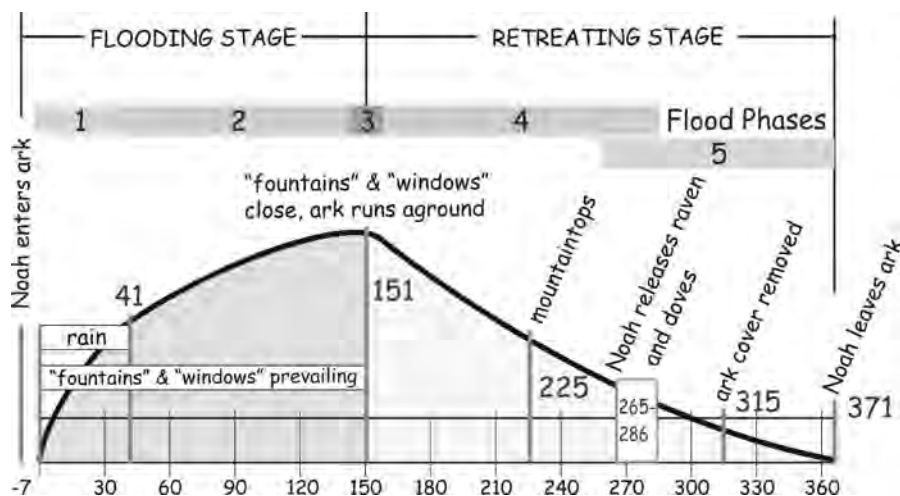


Figure 1. Walker's biblical geological timescale of the Flood related to events in the Flood, including the rise and fall of the water (drawn by Dr. John Reed).

and about 40 miles (65 km) north-south. They were uplifted by as much as 40,000 feet relative to the adjacent Green River and Uinta Basins (Hansen, 2005). As a result, significant erosion ensued. The Paleozoic, Mesozoic, and early Cenozoic strata (terms used for convenience) were eroded off the axis of the Uinta Mountains, exposing Precambrian quartzite, which forms the core of the Uintas (Figure 4).

Uneroded, tilted Phanerozoic rocks on both limbs of the Uinta anticline (Figure 5), some at very high angles, show late uplift of the mountain range. Some less resistant rocks were eroded into parallel strike valleys. Uplift and erosion are said to have occurred in the Cenozoic. From a diluvial point of view, both uplift and erosion indicate processes consistent with the recessional stage of the Flood.

Wild Mountain Upland Planation Surface

Summit flats, or planation surfaces, occur on many ranges in the Rocky Mountains (Small and Anderson, 1998). Their origin has been a mystery to uniformitarian geomorphology for over 100 years (Madole et al., 1987; Mears, 1993). Most think these surfaces formed in the mid- to late Cenozoic, but there is no convincing explanation or mechanism for these elevated erosional surfaces.

The summit flats on top of the Uinta Mountains cover 75 mi² (193 km²) and occupy 43% of the unglaciated areas above 11,000 feet (3,400 m). They likely represent erosional remnants of a single preexisting large planation surface (Munroe, 2006). A lower planation surface is also present, called the Gilbert Peak erosion surface (see below). The summit flats and highest elevations of the Uintas remained unglaciated during the Ice Age, as shown by pattern ground, polygonal-shaped cracks filled with debris, and uneroded blockfields, a thin accumulation of angular blocks of the bedrock (Munroe, 2007). Both features are indicative of a cold climate in unglaciated areas. Instead, glaciers were restricted to the high valleys with

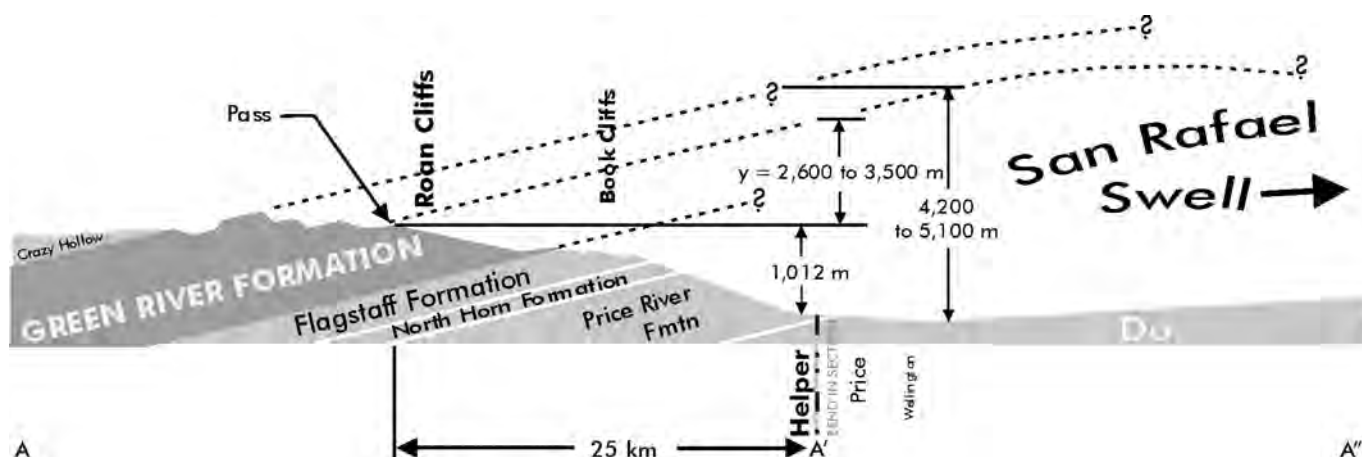


Figure 2. Cross-section of the sedimentary rocks of the north limb of the San Rafael Swell (drawn by Peter Klevberg). Dashed lines with question marks show the strata projected up over the San Rafael Swell, assuming no change in thickness. Du means diluvial undifferentiated. Note that the total erosion is about 14,000 to 17,000 feet (4.2 to 5.1 km).

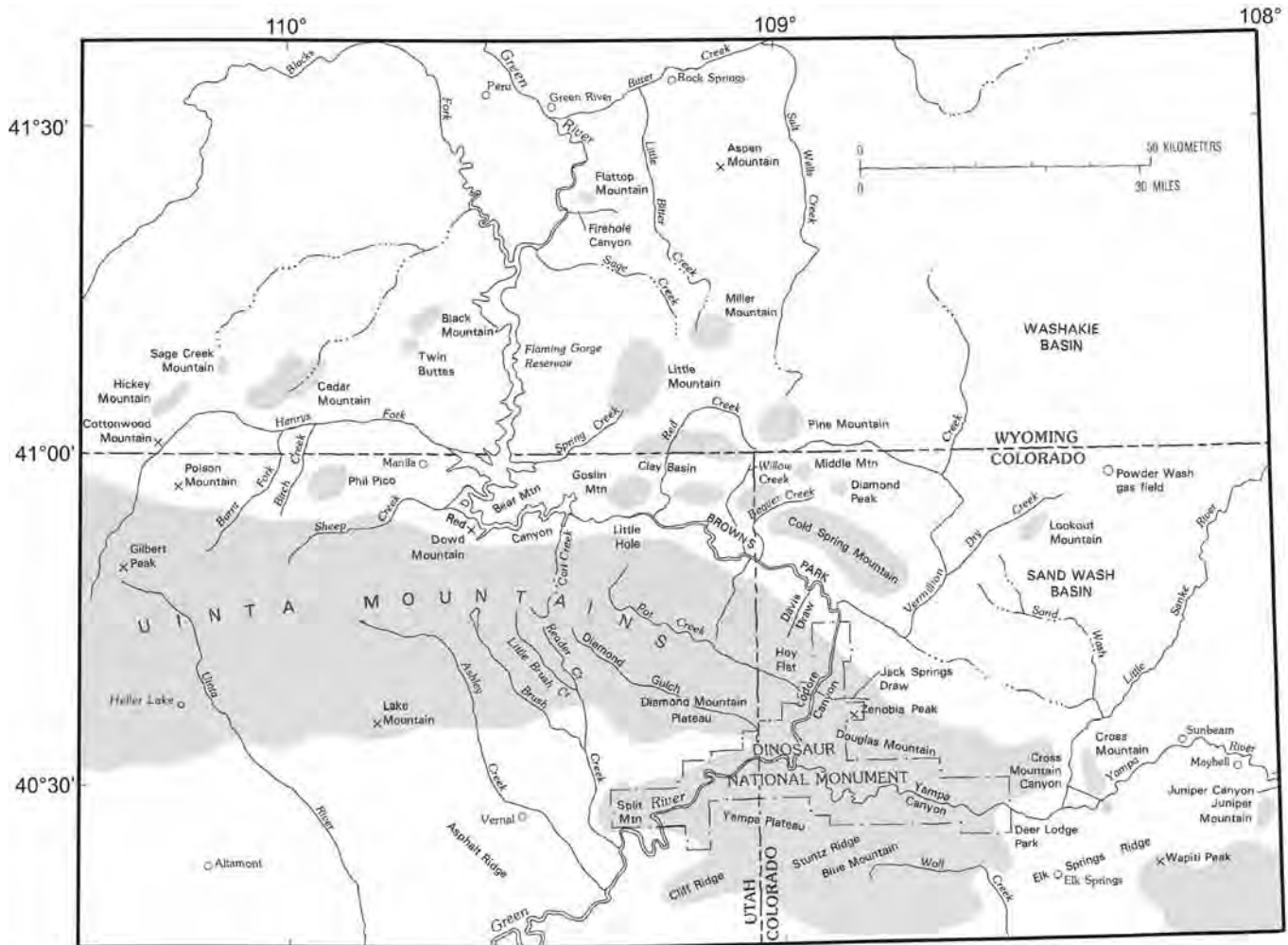


Figure 3. Regional setting of the Uinta Mountains with principal features. Grey represents mountains areas (from Hansen, 1986, p. 4).



Figure 4. The eroded Precambrian quartzite core of the western Uinta Mountains.

lobes extending down to lower valleys.

Hansen (1986) named the summit flats the Wild Mountain upland surface. Like practically all planation surfaces, it truncates the underlying formations without regard to rock structure or hardness. The planation surface follows the eastward plunge of the Uintas anticline and likely extends as far as Cross Mountain, a north-south ridge just east of the Uintas (Figure 6).

Initial confusion over the number and names of the planation surfaces has gradually been resolved. Wilmot Bradley (1936) thought there were four, and he called the *highest* the Gilbert Peak



Figure 5. Northward dipping sedimentary rocks on the north flank of the Uinta Mountains.

erosion surface. But he also recognized that extensive faulting and warping had made the identification and correlation of surfaces difficult. Some have suggested that there is only one planation surface—the Gilbert Peak—but there seem to be two distinct planation surfaces.

Following their paradigm of earth history, secular geologists assume that planation surfaces form as a result of slow erosion over millions of years in a stable tectonic setting.

It is generally accepted that the end result of a long period of erosion under relatively stable tectonic con-

ditions results in a surface of low relief, called a peneplain or pediplain (Zhang, 2008, p. 171).

The terms “peneplain” and “pediplain” are names for the end products of erosion and represent two different hypotheses of the origin of erosional surfaces. However, these terms have been almost universally discarded.

However, planation surfaces are yet another instance where geological theory conflicts with geological fact. Planation surfaces are flat or nearly flat erosion surfaces. We do not observe erosion forming flat surfaces today; in fact, many planation surfaces today are being dissected by erosion (Oard, 2008a). Thus, contrary to the actualist principle of geology, large, flat planation surfaces formed only at some time in the past and are not forming today. No theory based on uniformitarian principles has been able to explain this phenomenon.

Furthermore, every secular hypothesis addresses the formation of large, rolling-to-flat erosional surfaces near sea level. Elevated planation surfaces, such as those found in the Rocky Mountains, would then have formed prior to uplift.



Figure 6. The Wild Mountain upland surface at the top of Cross Mountain, a north-south mountain just to the east of the Uinta Mountains. The lower flat surface is the Gilbert Peak erosion surface capped by Bishop Conglomerate

But the evidence suggests otherwise. In other words, these surfaces formed at high elevations after uplift. There are virtually no mechanisms in the universe of observed geological causes that could account for these elevated planation surfaces (Calvet and Gunnell, 2008).

In an attempt to solve this problem, two hypotheses have been advanced. One is called the *piedmont backfilling and graded pediment hypothesis*. It posits infilling of adjacent basins to the height of the mountains (Babault et al., 2005), followed by erosion of the mountains to a flat surface at the same elevation as the top of the debris. The backfilled debris is a surrogate for “sea level” in the old hypotheses. Then the debris is eroded back down into today’s valleys. This hypothesis has been applied to the Pyrenees Mountains of northern Spain. However, it has been criticized for lack of evidence, especially that there is no indication that adjacent basins were ever filled to the elevation of the planation surface (Gunnell and Calvet, 2006). Also, this theory would not apply to lower elevations near sea level. Even in the Pyrenees, the theory strains credulity. The planation surface on the axis of the eastern Pyrenees Mountains is believed to be Miocene in age (early late Cenozoic). In other words, the planation surface has not been eroded at all, while at the same time thousands of feet of sedimentary rock and conglomerate were supposedly erased from the semi-arid Ebro Basin to the south. This theory does not seem reasonable.

The second hypothesis is called the *antiplanation hypothesis*, but it is also referred to as the *periglacial* or *cryoplanation hypothesis*. It proposes that the flat surfaces formed at elevation and very recently, during the last ice age. Its mechanism is freeze-thaw weathering by late spring snow banks that locally flatten rough terrain. In that sense, it can be considered a corollary of the weathering hypothesis, and like that theory it has many problems (Oard, 2011b). The ob-

served process results in the formation of cirques and small flat terraces on ridges and hillslopes but rarely on the summits of mountains or hills (Nelson, 1998).

Munroe (2006) applies this theory to the Wild Mountain upland surface of the Uintas, but he does not explain the mechanism in detail. Others are critical of the antiplanation hypothesis because it “bestows on periglacial processes [cold climate weathering] formidable powers of rock beveling that have been vigorously disputed” (Calvet and Gunnell, 2008, p. 152). It also cannot explain planation surfaces at variable elevations, which would be subject to differential weathering. Also some mountaintop planation surfaces were not in mountains that were glaciated in the valleys. Calvet and Gunnell (2008, p. 154) summarize the problems with this hypothesis:

The periglacial hypothesis is inconsistent because (i) it cannot explain any specifically observed local occurrences, and (ii) collectively it does not have the capacity to explain all occurrences across the region.

In summary, the origin of these planation surfaces is still a major conundrum, especially if the idea of reduction of a rough land to sea level is tossed out.

The question of erosion surfaces in mountain belts is a geomorphological conundrum as old as geomorphology itself. Given that in the Rocky Mountains, this issue still remains polarized after >100 years of controversy between an “uplifted peneplain” school and an “antiplanation” school, we feel that healthy debate should be extended to the Pyrenean orogeny (Gunnell and Calvet, 2006, p. 1).

The Gilbert Peak Erosion Surface

The Gilbert Peak erosion surface is the second, lower planation surface. It is actually a large dissected pediment most prominently displayed on the north side of the Uintas (Hansen, 1986). It was named by Wilmot Bradley (1936) based on his investigation of extensive remnants on the north and west slopes of Gilbert Peak on the north flank of the western Uintas. It slopes gradually northward, and traces are found about 60 miles (100 km) north (Figure 7). Some of the erosion surface, especially that close to the mountains, is bare rock (Figures 8 and 9), but most is capped by Bishop Conglomerate (see discussion below).

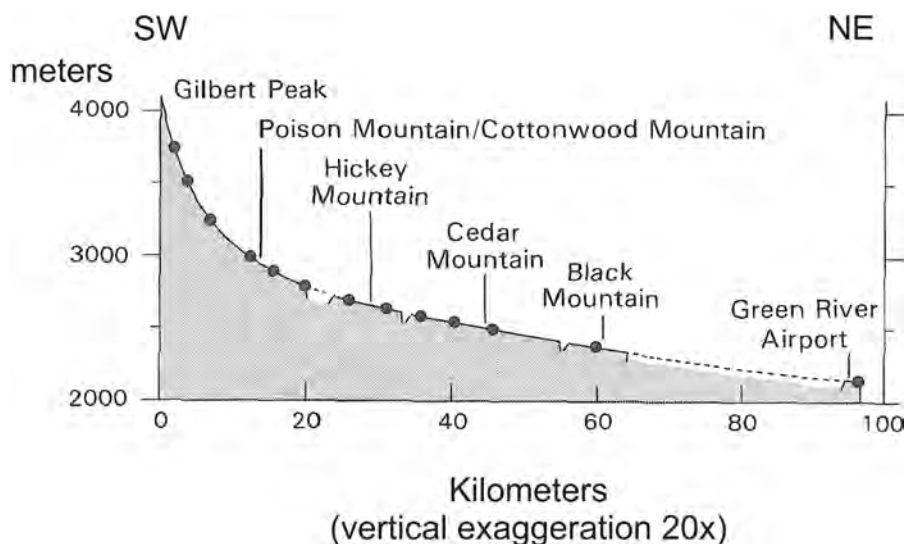


Figure 7. Location of remnants of the Gilbert Peak erosion surface from around Gilbert Peak northward to the town of Green River (from Hansen, 1986, p. 10).



Figure 8. The Gilbert Peak erosion surface with little Bishop Conglomerate on top in the background along the northern edge of the Uinta Mountains. View north across Red Canyon cut into the Uinta Mountain Group quartzite and the path of the Green River, now occupied by the water of Flaming Gorge.



Figure 9. A lake on the Gilbert Peak erosion surface with the higher northeastern Uinta Mountains in the background.



Figure 10. Diamond Mountain in the southeast Uinta Mountains where the Gilbert Peak erosion surface truncates south dipping strata at about a 15° angle.

The Gilbert Peak erosion surface truncates hard and soft rocks of all ages (Bradley, 1936; Hansen, 1986). Figure 10 shows truncated strata at Diamond Mountain Plateau, a remnant of the Gilbert Peak erosion surface. It is also capped by Bishop Conglomerate. Hansen (1986, p. 10) states:

The Gilbert Peak surface truncates hard and soft rocks alike, with little regard for lithology or structure, although resistant rocks stand well above the surface locally as hogbacks or monadnocks.

The monadnocks are usually close to the mountains. But modern-day erosion preferentially erodes soft rocks, resulting in the dissection of the landscape, not the formation of planation surfaces.

Erosion after the formation of the Gilbert Peak erosion surface, especially on the north side of the Uintas, dissected the pediment into erosional remnants capped by the Bishop Conglomerate. There are no soil horizons preserved beneath the Bishop Conglomerate (Bradley, 1936). In other words, formation of the planation surface occurred at the same time or was quickly followed by the deposition of the Bishop Conglomerate, and that deposition itself would have been rapid, given the current strength necessary to transport its cobbles and boulders.

The Gilbert Peak erosion surface before dissection was well developed on the north side of the Uinta Mountains. Because of faulting and erosion, the surface is at a lower altitude next to the mountains than farther north away from the mountains. The age of the surface is regarded as Oligocene by uniformitarian geologists (Hansen, 1986), yet it is little eroded on the top.

The tops of these mesas [just north of the Uinta Mountain axis] are slightly dissected by differential erosion, mostly along shaly zones, but viewed from a distance, most of them appear as almost perfectly flat plains. Cold Spring Mountain



Figure 11. Dutch John bench, an erosional remnant of the Gilbert Peak erosion surface, which is so flat that an airport was built on top of it (view west).



Figure 12. The north edge of Dutch John bench, showing the northward tilt of the Uinta Mountain Group quartzite (view west).

is especially noteworthy, but Dutch John Bench alone is almost pristine, virtually unaltered by erosion since middle Tertiary time. Being bare of gravel, except locally, all these remnants must have been near the mountainward limit of the pediment (Hansen, 1986, p. 12).

Such pristine features indicate youth and not an age of Oligocene (about 30 Ma). Figure 11 shows the flatness of the erosional remnant of the Gilbert Peak

erosion surface on Dutch John Bench, where there is an airport. Figure 12 shows that the erosion surface bevels northward dipping quartzite of the Uinta Mountain Group.

It is interesting that the eastern Pyrenees Mountains are generally similar to the eastern Uinta Mountains in having a dissected mountaintop planation surface and a lower altitude pediment along the edge of the dissected mountains (Calvet and Gunnell, 2008).

The Bishop Conglomerate

Cobbles and boulders of the Bishop Conglomerate cover most of the Gilbert Peak erosion surface (Rich, 1910). In the eastern Uinta Mountains, this formation is predominantly composed of red Uinta Group quartzite eroded from the heart of the mountains (Figures 13 and 14). The conglomerate ranges up to about 650 feet (200 m) thick on the southeast end of the Diamond Mountain Plateau in the southeast Uinta Mountains (Hansen, 1986). Boulders up to 6.5 feet (2 m) long are found only a few miles from their nearest possible source. The boulders generally decrease in size away from the Uinta Mountain axis, although Hansen (1986) reported a 6.5 feet (2 m) boulder of the quartzite on Miller Mountain, 15 miles (24 km) north from the nearest possible source. The boulders are commonly rounded to subrounded, having been eroded by water. Figure 15 shows a subrounded boulder about 6.5 feet (2 m) long axis on the Gilbert Peak erosion surface north of Blue Mountain, southeast Uinta Mountains.

The Bishop Conglomerate was probably once nearly continuous along the north, east, and south sides of the Uinta Range (Hansen, 1986). Present-day rivers and the Browns Park Formation (that infilled the syncline from the collapsed east dome of the Uintas) (Figure 16) postdate the Bishop Conglomerate (Bradley, 1936; Hansen, 1986, p. 8), although it is possible that some of the Bishop Conglomerate was deposited late during the deposition of the Browns Park Formation.

Water Gaps

The Green and Yampa Rivers flow through numerous water gaps in the Uinta Mountains (Oard, 2010a). A water gap is “a deep pass in a mountain ridge, through which a stream flows; esp. a narrow gorge or ravine cut through resistant rocks by an antecedent or superposed stream” (Neuendorf et al., 2005, p. 715). In other words, a water gap is a

perpendicular cut through a mountain range, ridge, or other structural barrier, forming a gorge through which a river or stream flows. The dictionary definition unfortunately strays from description and mentions two theories of origin. Also, that definition is too narrow. It does

not mention gaps cut through just one mountain and those bisecting plateaus or a series of plateaus. More extensive water gaps are more difficult to explain. For the purposes of this paper, a water gap is an eroded gap carrying a stream or river through a structural barrier. The

most interesting water gaps are those that pass through high terrain when there appears to have been an easier, lower route around the barrier.

The Green River flows through a number of water gaps in the Uinta Mountains. From Green River, Wyoming, the river flows south, straight toward the Uinta Mountains, rather than following the topography to the east. At the northern slopes of the Uintas, it flows through the front of the range, entering Browns Park.

Probably the strangest water gap is Horseshoe Canyon. The river starts through one of the tilted ridges of the northern Uintas, then turns and flows back north, ending up only half a mile (1 km) down a valley from where it entered (Figure 17). Horseshoe Canyon was first described by John Wesley Powell in 1895.

Where the river turns to the left above, it takes a course directly into the mountain, penetrating to its very heart, then wheels back upon itself, and runs out into the valley from which it started only half a mile below the point at which it entered; so the canyon is in the form of an elongated letter U, with the apex



Figure 13. Bishop Conglomerate on the Gilbert Peak erosion surface on top of Blue Mountain, extreme southeast Uinta Mountains.



Figure 14. Bishop Conglomerate on top of the Gilbert Peak erosion surface on Diamond Mountain.



Figure 15. Subrounded boulder of Bishop Conglomerate about 6.5 feet (2 m) long axis on the Gilbert Peak erosion surface north of Blue Mountain, southeast Uinta Mountains.



Figure 16. Browns Park, the collapsed eastern axis of the Uinta Mountains, which is filled with up to 1,965 feet (600 m) of sandstone, volcanic tuff, and conglomerate (view northwest).

in the center of the mountain. We name it Horseshoe Canyon (Powell, 1961, p. 137).

The Green River then flows through Browns Park (Figure 16), but its course is not influenced by the topography of the valley. Had the river simply flowed a few miles to the east, it could have *easily passed around* the eastern end of the Uinta Mountains at a much lower elevation (Powell, 2005). Instead, the river flows *through* the eastern Uintas, in a major water gap with entrenched meanders in hard quartzite (Bradley, 1936; Powell, 2005). This water gap is named Lodore Canyon, or Gates of Lodore (Figure 18), a narrow slot canyon with walls 2,300 feet (701 m) high.

But in the Canyon of Lodore, not only is the valley not wider than the river; there is no valley. Call Lodore what you will—arroyo, canyon, chasm, cleft, defile, gorge, gulch, rift—a “valley” it is not (Powell, 2005, p. 48).

To add to the puzzle, the Lodore water gap is considered young, only about 5 million years old, within the uniformitarian timescale (Powell, 2005).

The unexpected course of the Green River through the Uintas has generated several theories, but none are satisfactory. John Wesley Powell, who first floated down the Green River through Lodore Canyon and into the Grand Canyon in 1869, was puzzled over the course of the river.

Powell was struck by the manner in which the Green River *ignored and often bypassed* low-lying open valleys, only to *turn headlong into solid bedrock canyons*, such as the Canyon of Lodore on the east flank of the uplifted Uinta Mountains (Ranney, 2005, p. 63, emphasis added).

Bradley stated that the river ignores both the topography and structure and that its meanders are not affected by hard or soft rock.

Likewise Sears has shown that the course of the Green River upstream and downstream from Lodore Canyon was superimposed through the Browns Park formation. Its present course is *almost independent of topography and structure*. It flows in wide, well-formed meanders whose amplitude is approximately the same where the river flows through hard Uinta Mountain quartzite as where it flows through the soft Tertiary rocks (Bradley, 1936, p. 189, emphasis added).

But that is not all. After the Green River meets the Yampa River in the heart of the southeast Uinta Mountains, it passes through the southern anticline of the southeast Uinta Mountains called Split Mountain in a canyon over 2,500 feet (760 m) deep (Figure 19). Moreover, part of the course of the river runs *along* the long dimension of the anticline.

The Yampa River on the northeastern Colorado Plateau emerges from



Figure 17. Horseshoe Canyon (from Powell, 1961, p. 136). The Green River flowing from left to right enters the northern Uinta Mountains and then flows back out into the same valley only half a mile away.



Figure 18. Lodore Canyon of the Green River entering the eastern Uinta Mountains in a slot Canyon 2,300 feet (701 m) high. The river easily could have gone around the mountains toward the east. The canyon is considered only 5 Ma within the uniformitarian timescale.



Figure 19. Aerial photo of the western Split Mountain anticline. The Green River passes through the anticline, flowing at times along the eroded axis. The river easily could have passed around the north and west ends (view west, photo courtesy of Tony Kostusik).



Figure 20. Water gap of the Yampa River through Cross Mountain, a north-south mountain 1,000 feet (300 m) high east of the Uinta Mountains.

the Rocky Mountains foothills into open country, and then “crosses two anticlinal upwarps with apparent disregard for rock structure” (Hunt, 1956, p. 68). One anticlinal ridge is Cross Mountain, Colorado (Figure 6), in which the Yampa River passes through in a 1,000-foot (300-m) deep, vertically walled gorge (Figure 20). Hard rocks that have been elevated should be able to deflect a river, but that is not the case with the

Yampa River. Although it easily could have bypassed these anticlines on softer rocks, it did not.

John Wesley Powell explained the water gaps as antecedent; river courses predated uplift, which was sufficiently slow to allow the river to erode its channel vertically and maintain its course. But the Green and Yampa Rivers postdate the Bishop Conglomerate, which means the mountains predated the rivers (Hansen, 1986). Although the antecedent stream hypothesis has been long discredited, it is still presented to the public in the Utah Field House of Natural History State Park Museum at Vernal, Utah (Figure 21).

Green River through the Uinta Mountains. Most rivers flow away from mountains, not toward them. But the Green, draining the mountains and plains of southern Wyoming, cuts sharply into the Uinta Mountains at the Wyoming-Utah State line, then flows 175 km east and south across the range through Utah and Colorado without regard to topographic relief or geologic structure (Hansen, 1986, p. 62).

Flood Explanation

Secular geology is stymied by the facts, but these geomorphological features are

exhumed surface. The Gilbert Peak pediment likely formed when the water was forced to flow at high speed around the mountains as they were emerging from the Floodwater.

Pediments are readily explained by rapid currents flowing parallel to mountain ranges, eroding the rock at the edge (Oard, 2004). Most hypotheses for the origin of pediments postulate water coming out of the mountains and somehow scraping the foothills down to a flat surface. We do not observe pediments being formed today. Instead, water forms valleys and canyons, destroying the pediments, not forming them. It is obvious that pediments formed by water flowing parallel to the mountains since exotic rocks from upstream are sometimes found on pediments, as noted by Crickmay (1975). I have observed them on many pediments. Rocks from the adjacent mountains also are laid on the pediment since Floodwater was also draining and eroding off the mountains. So rocks on top of the pediment come from both the adjacent mountains and upstream.

Also, the phenomenon of pediment passes, in which pediments form on opposite sides of the mountains but merge at the top at different angles (Howard, 1942a, 1942b), indicates that pediments were *not* formed by streams issuing from the mountains. At the top, there is no mountain left for streams to issue and erode the sides of the mountain. Pediment passes provide strong evidence that pediments were carved by currents flowing parallel to the mountains.

The reason why the Uinta pediment was more developed on the north side—running the length of the Uinta Mountains and extending north over 60 miles (100 km)—was because the water flow was less restricted north of the Uinta Mountains while the Wasatch Mountains would have impeded flow along the south side of the Uinta range. The flow was very likely moving east when the pediment formed since the

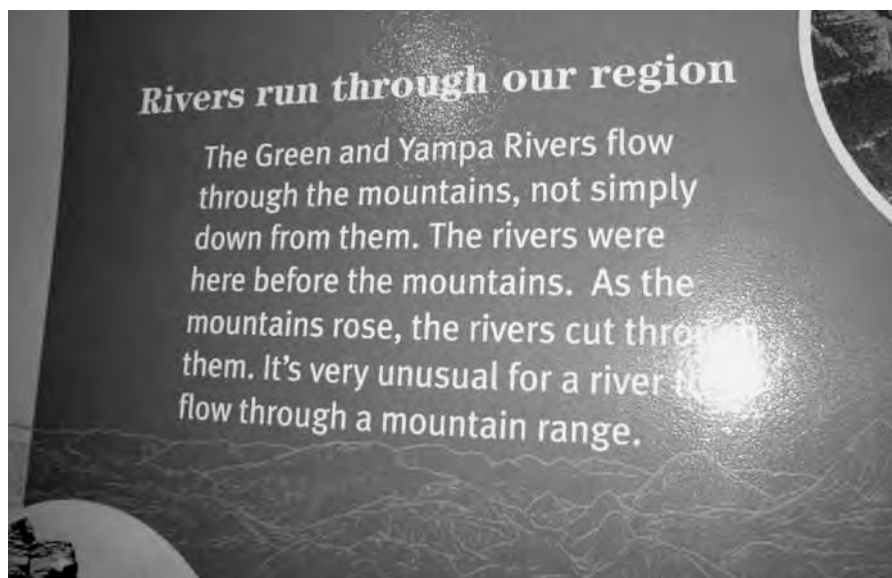


Figure 21. Sign in the Utah Field House of Natural History State Park Museum at Vernal, Utah, claiming that the Green and Yampa River water gaps were formed by antecedent rivers—a hypothesis long discredited.

Hansen (1986) advocated the stream capture hypothesis for the Green River and superimposition for the Yampa River through Juniper and Cross Mountains. But he presented no evidence for either. He recognizes the conundrum.

For more than 100 years geologists have pondered the course of the

readily explained by the recessional stage of the Flood (Oard, 2006, 2008a). The mountaintop Wild Mountain upland planation surfaces could have formed early during Flood runoff, or it could have formed early in the Flood, covered by sediments, and then re-exposed. Such a planation surface would be called an

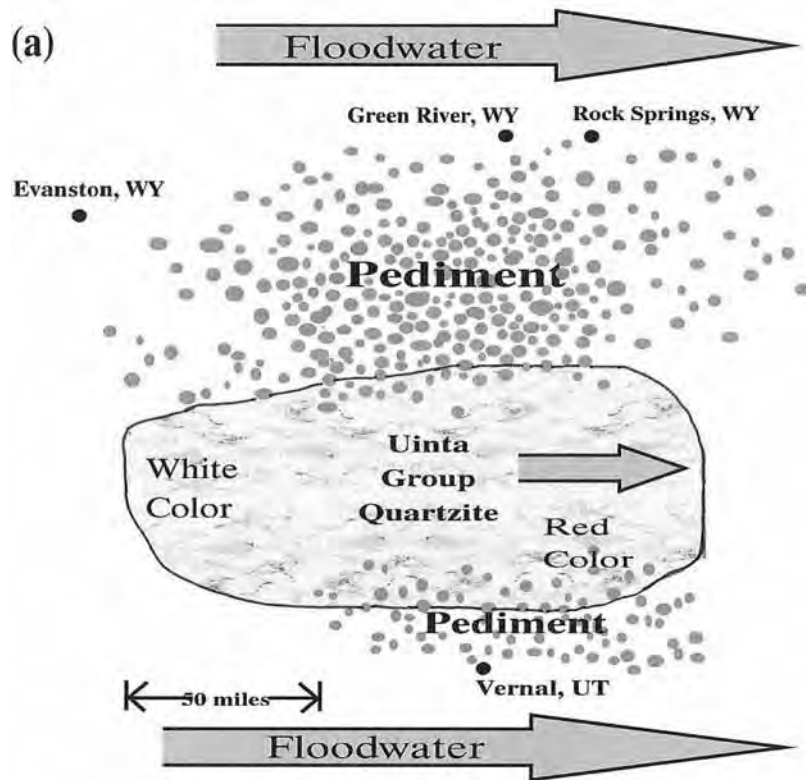


Figure 22a. Schematic of the plan view (from above) of the formation of pediments (Gilbert Peak erosion surface) capped by Bishop Conglomerate on the north and south side of the Uinta Mountains during channelized Flood runoff (drawn by Melanie Richard).

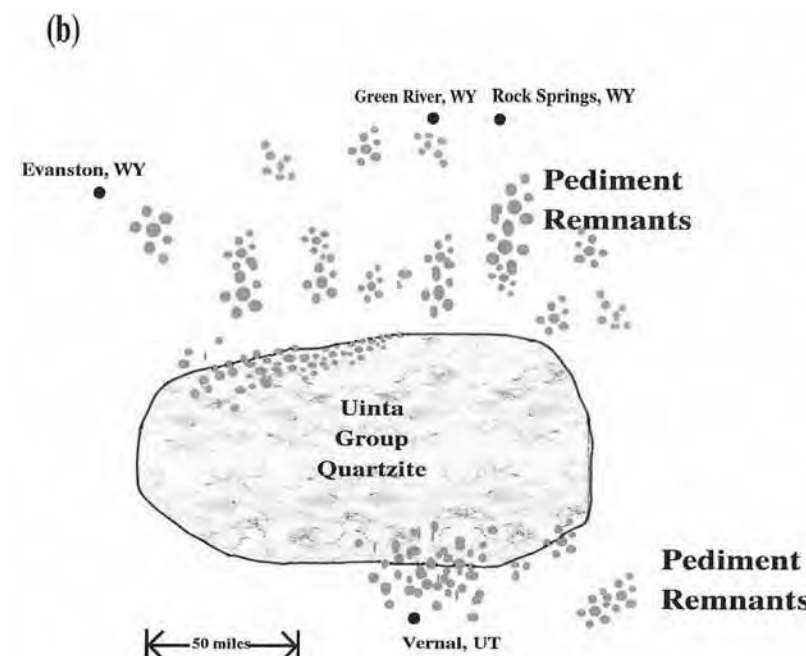


Figure 22b. Schematic of the subsequent dissection of the pediments into erosional remnants (drawn by Melanie Richard).

pediment slopes down to the east, and the Green River was deflected east upon approaching the Uinta Mountains. Moreover, the Bishop Conglomerate shed from the mountains was not deposited northwest of the Uinta Mountains (Reheis et al., 2009, p. 18) while it was spread northeast of the range (Hansen, 1986). This would imply that as the cobbles and boulders of the Bishop Conglomerate were spread northward, they were shunted east by an east-flowing Flood current. Figure 22a shows a schematic of the origin of the cobble-and boulder-capped pediments on the north and south side of the Uinta Mountains during Flood runoff and the subsequent dissection of the pediments into erosional remnants (Figure 22b).

The water gaps would form later, as the receding Floodwater transitioned from its early sheet-flow mode to channelized flow. This is supported by the relative ages of the gaps, which formed after the planation surfaces and after deposition of the Bishop Conglomerate around the Uinta Mountains. Water gaps would have developed when receding Floodwater shifted to channelized flow, rapidly cutting canyons and gorges across elevation features (Oard, 2008b, 2010a). It was also during this time that the Gilbert Peak erosion surface would have been dissected into the present erosional remnants.

The Flood/Post-Flood Boundary

One implication of this study is that the post-Flood boundary at the Uinta Mountains is equivalent to secular geologists' late Cenozoic. Geologists date the 40,000 feet (12 km) of differential uplift of the Uinta Mountains and subsidence of the adjacent basins, the massive erosion of tens of thousands of feet of strata from the top, and the formation of the Wild Mountain upland surface to the mid- and late Cenozoic. The Gilbert Peak erosion surface, the spread of the Bishop Conglomerate, and the cutting of the water gaps occurred in the late

Cenozoic. Oard (2012, Figure 14) shows this sequence.

The Uinta Mountains are not unique; other ranges in the Rocky Mountains had a similar history, implying that the post-Flood boundary is in the very late Cenozoic across the region. Although there are bound to be problem areas within geology and paleontology, I have generally found the same boundary worldwide, based on numerous criteria (Oard, 1996, 2007).

This strongly suggests that extensive post-Flood catastrophes, other than those associated with the Ice Age, did not occur. Thus, events from the Cenozoic rock record are those of the late stages of the Flood. In addition to significant erosion and tectonism, the manner in which planation surfaces, pediments, long-transported boulders, erosional remnants, water and wind gaps, the continental shelf and slope, and submarine canyons all formed indicates the work of the Flood. The proposed Cretaceous/Tertiary boundary, or even in the early Cenozoic, making all or most of the Cenozoic post-Flood, does not seem tenable (Oard, 2010b, 2010c, 2011a). The idea that even the Mesozoic and Paleozoic are post-Flood (Tyler, 2006) is problematic and unlikely (Reed et al., 2009).

Flood Deposition of Green River Formation

Another implication of the Uinta Mountains geomorphology affects debates between diluvialists over the age of the Green River Formation. If the post-Flood boundary described above is correct, then the Green River Formation must have been deposited during the Flood, not in a post-Flood lake. This is further shown by a significant observation. North of the Uinta Mountains, the Bishop Conglomerate, which rests atop the erosional remnants of the Gilbert Peak erosion surface, also overlies and has eroded into sedimentary rocks of the Green River and Bridger Formations (Hansen, 1986) (Figures 23 to 30). The



Figure 23. Remnant of Gilbert Peak erosion surface on Little Mountain north of Uinta Mountains (view north from north edge of the Uinta Mountains across intervening eroded valley).



Figure 24. Remnant of Gilbert Peak erosion surface on Little Mountain north of Uinta Mountains (view west from erosion surface on Miller Mountain).



Figure 25. Remnant of Gilbert Peak erosion surface on the south edge of Miller Mountain north of Uinta Mountains (view west with Little Mountain in the background).



Figure 26. The Bishop Conglomerate capping the Gilbert Peak erosion surface on Miller Mountain. The erosion surface truncates dipping beds of the Green River Formation (view southeast).



Figure 27. The Bishop Conglomerate capping the Gilbert Peak erosion surface on the south end of Miller Mountain.



Figure 28. Close-up of a subrounded boulder of the Bishop Conglomerate on the south end of Miller Mountain.

Bridger Formation is a predominantly volcanic layer overlying the Green River Formation. If the Gilbert Peak erosion surface and Bishop Conglomerate were

formed by the Flood, then it stands to reason that underlying strata were also. This supports previously published evidence of significant erosion (requiring

the energy of the Flood) of the outcropping of the Green River Formation at the San Rafael Swell (see Figure 2) (Oard and Klevberg, 2008).



Figure 29. Remnant of the Gilbert Peak erosion surface on Cedar Mountain, north of the Uinta Mountains (view north).



Figure 30. The volcanic Bridger Formation of Cedar Mountain, capped by Bishop Conglomerate.

Summary

The Uinta Mountains formed late in the Flood when significant differential vertical movement occurred, resulting in the concomitant uplift of the mountains and downwarping of adjacent basins. During and after this uplift, erosion on a large scale created geomorphological features not easily explained by secular theories, but that are readily integrated with the events of the recessional stage of the Flood. In chronological order these include (1) the Wild Mountain upland surface at the tops of the highest mountains; (2) the Gilbert Peak erosion surface, mainly a pediment best developed on the north side; (3) cobbles and boulders of the Bishop Conglomerate deposited on top of the Gilbert Peak surface; (4) the dissection of the Gilbert Peak surface into erosional remnants; and (5) the many water gaps on the Green and Yampa Rivers. The tectonics, erosion, and landform development fit in very well during the recessional stage of the Flood, suggesting that the post-Flood boundary is in the very late Cenozoic in this area (and probably for the region). Thus, the Green River Formation, found both north and south of the Uinta Mountains would also be a Flood deposit and not from a post-Flood lake.

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An Analysis of Astronomical Aspects of the Hydroplate Theory

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Abstract

In his hydroplate model, Walt Brown makes a number of statements and claims concerning astronomical issues. Many of these statements and claims are incorrect and/or misleading. This study presents an analysis of these problems. It is left to others to judge the merits of the geological arguments of the hydroplate theory.

Introduction

For about 30 years, Walt Brown has developed his hydroplate theory of the Flood. This model proposes that the originally created earth had vast subterranean chambers of water. Between the Creation Week and the Flood, the subterranean chambers were heated, and the pressure increased. At the time of the Flood, these chambers erupted. According to the model, a portion of the water released was the source of much of the water during the Flood. However, much of the ejected water pierced through the atmosphere into interplanetary space. Most of this water later condensed to form asteroids, comets, meteoroids, and some of the satellites of the outer planets. Thus, in the hydroplate model, these bodies did not exist from the original creation but instead originated as a result of the Flood. In this paper we will examine many of the claims of the hydroplate model that involve astronomical issues. We will leave it to others to evaluate the terrestrial geology claims of the hydroplate model.

Brown has reached a large lay audience with his website and his book, *In the Beginning* (Brown, 2008). Since 1980, up unto the writing of this article, this book has gone through eight editions. Since the website can be updated at any time, the quotes in this paper come from the eighth edition (Brown, 2008) of the book. This present paper came about from an interaction I recently had with Dr. Brown. He took exception to

some critical comments that I had made on the CRS Internet discussion group. A few brief e-mails ensued, followed by a lengthy phone conversation. A few months later, he learned that I was traveling near his home and graciously invited me to come by for conversation with a few other people, a conversation that lasted more than two hours. Afterward, we exchanged several lengthy e-mails. In those e-mails I attempted to resolve with him some of the issues raised here, but these attempts met with little success.

Cometary Water from the Earth?

Brown (2008, pp. 274–275) notes that water is a major constituent of comets and that water is common on the earth.

About 38% of a comet's mass is frozen water. Therefore, to understand comet origins, one must ask, "Where is water found?" Earth, sometimes called "the water planet," must head the list. (The volume of water on Earth is ten times greater than the volume of all land above sea level.) Other planets, moons, and even interstellar space have only traces of water, or possible water. Some traces, instead of producing comets, may have been delivered by comets or by water vapor that the fountains of the great deep launched into space.

Water is more abundant in the cosmos than Dr. Brown gives it credit for, and it is less abundant on earth than he implies.

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Water not only exists on other planets and satellites but also exists in the interstellar medium (ISM) and in the atmospheres of cool stars. Taking the estimated mass of the earth's oceans and dividing by the earth's mass, we find that water makes up only 2.1×10^{-4} of the earth's mass. The fact that most of the earth's water appears to be on its surface is a bit misleading (though some water may exist in the earth's mantle, at this time we do not know how much, if any, exists there). Ganymede and Callisto (two of the four larger Galilean satellites of Jupiter) have densities of a little less than 2.0 gm/cc. This is consistent with their composition being about 50–50% mixture of water and ice. Together, they likely contain 100 times more water than the earth's oceans currently contain. By Dr. Brown's reasoning for the terrestrial origin of comets, a better case could be made for Ganymede and Callisto as the likely source of comets. Alternately, Ganymede and Callisto could have come from the earth too, but their masses are far too great for that. However, he remains silent on the origin of these two satellites, suggesting that he believes that they likely are primordial, that is, they date from the Creation Week. This is inconsistent, for Dr. Brown uses the high water content of the smaller bodies of the solar system to argue for a terrestrial origin.

For that matter, high water content is a common feature of smaller solar system bodies far from the sun. For instance, the densities of the smaller satellites of the Jovian planets we have been able to measure are between one and two, consistent with more than one-half composition being water. Pluto and its largest satellite Charon have density of about 2.0, suggesting half water, half rock composition. Again, high water content is a common feature of solar system objects far from the sun. Comets are solar system objects far from the sun. Rather than seeing that comets resemble the earth, it is clear that comets better resemble other solar system objects far from the sun. In fact, this coincidence of high water content of planets, satellites, and asteroids far from the sun and comets (which also are far from the sun) has suggested to evolutionary astronomers a common origin.

Noting that water figured greatly in the Flood, Dr. Brown considers it likely that sufficient water was ejected from the earth at the time of the Flood to produce all the comets. According to his model, the subterranean water was under tremendous pressure, sufficient to blast much of the water through the earth's atmosphere and into space. To do this, the water must achieve escape velocity from the earth (about 7 mi/s = 11 km/s) plus additional speed to overcome the sun's escape velocity. Consider this quote from Brown (2008, p. 277):

To escape Earth's gravity and enter only a circular orbit around the Sun requires a launch velocity of 7 miles per second. However, to produce near-parabolic, retrograde orbits requires a launch velocity of 32 miles per second! Earth's atmosphere would offer comparatively little resistance at such speeds. In

seconds, the pulsating, jetting fountains would push the thin atmosphere aside, much as water from a fire hose quickly penetrates a thin wall.

This last sentence is a huge assertion, offered without any justification or supporting calculation. For our purposes here, we will not question the high pressure in the subterranean chambers nor the mechanisms supposed to provide the tremendous pressure. Instead, we will treat the chambers as a black box and deal with issues following release of the jets. There must be some interaction between the jets and the earth's atmosphere, so an obvious question to ask is how much kinetic energy is transferred from the jets into the atmosphere. There are two obvious mechanisms that will transfer this kinetic energy.

Water moving at this speed is moving at Mach 150! This is beyond supersonic into hypersonic speeds. Modeling this properly would be very difficult. Such high speeds undoubtedly would produce tremendous turbulence. Turbulence will slow at least a portion of the water jet and transfer kinetic energy to the atmosphere. A portion of this energy transfer would cause some of the earth's atmosphere to be carried along into space as well, though this too would be difficult to model and hence estimate. There will also be other interactions between the jets and the earth's atmosphere. The leading edge of a jet will slam into the atmosphere, and the air in the way will have to be shoved out of the way via momentum transfer. However, as the leading edge of the jet transfers momentum to the air, it would then move more slowly. Material behind the leading edge will subsequently move faster than the leading edge, which will lead to a collision between the slower moving leading edge and the faster moving material immediately below. Of course, this collision will slow down the water below the leading edge, leading to collision with still more water lower in the jet. This cascading effect will cause the leading edge of the jet to spread horizontally. Eventually, the jet could penetrate through the atmosphere, but this pancaking of the leading edge of the jet is one way in which a large amount of kinetic energy transfers from the jets to the atmosphere.

Assuming that a jet eventually penetrated through the atmosphere, there will be a very large inrush of air toward the jet. The jet is a fluid passing through another fluid (the atmosphere) with large relative velocity. Since the jet is moving Mach 150 and the atmosphere is essentially stagnate, Bernoulli's equation will produce a very large pressure difference that will drive air into the jet. Calculation shows that the pressure difference is nearly one atmosphere, and that the resulting speed of the inrushing air is nearly the speed of sound. Once the inrushing air slams into the sides of the jet, there will be large viscous motions between the two. This is a second way in which kinetic energy from the jet will transfer to the atmosphere. When chaotic transfer of kinetic energy happens as with these two mechanisms, the kinetic energy is quickly randomized into

microscopic motion of the particles. We recognize that random microscopic particle motion is heat, so we say that the kinetic energy is thermalized.

How much thermalization of the kinetic energy of the jets would have occurred? This is difficult to say precisely, for it would require very detailed computation, and it is doubtful that our current models would permit realistic computation anyway. So let us use a very common practice in physics and astronomy of doing a “back of envelope” calculation. Let us assume for the sake of argument that only one millionth of the kinetic energy of the jets would be thermalized into the atmosphere. This figure is probably far too conservative, and the percentage of thermalized energy transfer is likely far higher. We make the following assumptions.

- The total mass of the jets
- The average velocity of the jets
- The mass of the earth’s atmosphere
- The specific heat of air

Assumptions 1 and 2 yield the total kinetic energy. Dr. Brown has already done this calculation for his estimate of the material (both water and rock dislodged by the water as it is ejected upward) required to account for comets, asteroids, and small satellites of the Jovian planets (Brown, 2008, p. 424). He found 1.7×10^{29} J. One millionth of this available energy is 1.7×10^{23} J. One can find the current mass of the earth’s atmosphere by multiplying one atmosphere of pressure (roughly 10^5 Pa), by the earth’s surface area, and dividing by the acceleration of gravity, 9.8 m/s^2 . This yields a mass of approximately 5×10^{18} kg. The specific heat of air is approximately $1,000 \text{ J/kg C}$. The formula for heat transfer is

$$Q = c m \Delta T,$$

where Q is the available heat, c the specific heat of air, m the mass of the earth’s atmosphere, and ΔT is the change in temperature of the earth’s atmosphere. Solving, we find that the change in temperature is 34 C . Thus, assuming that only one millionth of the jet energy is thermalized to the atmosphere and that heat is distributed uniformly, we find an atmospheric temperature increase of 34 C . This is in addition to other heating mechanisms, such as from volcanic activity and the latent heat of vaporization from rainfall. This is an unrealistically high temperature increase, and it is doubtful that the energy transfer was this minimal. With more realistic energy transfer, it ought to be obvious that trying to pass this much matter through the earth’s atmosphere at such speed is not possible.

The casual way in which he asserts that the jets from the subterranean chambers could so easily penetrate the earth’s atmosphere is most remarkable in light of his conclusion that even with enough energy, the fragments must be large enough to pass through Mars’ atmosphere. To see the difficulty, imagine

throwing a ball high into the air. Then visualize how hard it would be to throw a handful of dust that high. Atmospheric drag, even in Mars’ thin atmosphere, absorbs too much of the smaller particles’ kinetic energy (Brown, 2008, p. 306).

With this conclusion, Brown dismisses the belief that some meteorites found on earth originated on Mars. Those rocks allegedly were blasted off the surface of Mars by Meteoroid impacts. Mars has an extremely thin atmosphere and less gravity than earth, but he claims that that thin atmosphere is sufficient to prevent rocks from being lifted off the surface of Mars. Yet, Dr. Brown thinks that much more massive jets of water could have penetrated a much denser terrestrial atmosphere as if the atmosphere were not there. Given that rock is denser than water and that, being a fluid, a water jet will fragment into small drops, water ought to be more susceptible to atmospheric drag than rock is.

Problem of Long Period Comets

It is very questionable whether enough matter could have been ejected from the earth to account for the comets and asteroids that we see. However, there are many other astronomical problems for the hydroplate model to overcome. For instance, there are many comets with orbital periods around the sun that are very long, on the order of a million years. Assuming, as Brown does, that the Flood was approximately 5,000 years ago, very long-period comets would not have had enough time to complete their first orbits and thus have returned to the inner solar system. We observe only a small portion of a comet’s orbit near perihelion. From this small portion of the orbit, we can use Newtonian mechanics to compute the entire orbit. The most important orbital parameter for our discussion right now is the period (the semi-major axis is related to the period, and the other parameters, the eccentricity, inclination, arguments of perihelion and ascending node, will be important later).

The orbital period of any object depends upon the mass of the body about which the object orbits. Since comets orbit the sun, it is the mass of the sun, or more generally, the solar system, that determines the period. Since the sun’s mass so dominates what we know about in the solar system, to a very good approximation, it is the mass of the sun that determines the orbital periods of comets. Dr. Brown argues that if we have underdetermined the mass of the solar system by as little as 0.17%, the comets that we think have periods on the order of a million years could have orbital periods of less than 5,000 years. Thus, extremely long-period comets could return to the inner solar system much sooner than we think, and very long-period comets are not a problem for a Flood only 5,000 years ago. Quoting Brown (2008, p. 276),

The distance (50,000 AU) is in error. Comets more than about 12 AU from the Sun cannot be seen, so both the

distances they have fallen and their orbital periods must be calculated from the small portions of their orbits that can be observed. Both calculations are extremely sensitive to the mass of the solar system. If this mass has been underestimated by as little as about 17 parts in 10,000 (about the mass of two Jupiters), the true distance would be 585 AU and the period only 5,000 years.

Where might the missing mass be hiding? Probably not in the planetary region. The masses of the Sun, planets, and some moons are well known, because masses in space can be accurately measured if something orbits them and the orbit is closely observed. However, if extra mass is thinly spread within 40–600 AU from the Sun (beyond Pluto's orbit), only objects outside 40 AU would be gravitationally affected. (Recall the hollow sphere result on page 270.) That mass, depending on its distribution, could considerably shorten the periods of near-parabolic comets, because they spend 99% of their time at least 40 AU from the Sun.

There are several issues that I must address in this critique, but first an understanding of the Oort cloud (the hypothetical source of long-period comets) is necessary. For a long time, astronomers have known that individual comets have relatively short lifetimes, so the existence of comets today suggest that the solar system is far younger than billions of years. About 1950 the Dutch astronomer Jan Oort tabulated the aphelia of all comets known at that time and noticed that many of them had aphelia at very great, poorly determined distances from the sun. More precisely, Oort plotted a histogram of comet aphelia and found a large number clumped near $1/a$ approaching zero. He reasoned that this clump might represent the source of comets. He estimated that a comet's maximum aphelion distance was about 50,000 AU, or else gravitational perturbations from other stars likely would remove the comet from the sun's grasp, so this is the basis of the 50,000 AU figure. According to Oort, the sun is orbited by a huge number of comet nuclei many thousands of AU from the sun. This roughly spherical distribution is the hypothetical Oort cloud. Being so far from the sun, the comet nuclei remain very cool and indefinitely retain their volatiles, even for billions of years. Occasional gravitational perturbations of other stars rob some of the nuclei of enough orbital energy so that those nuclei fall to perihelia close to the sun so that they flare up and appear as comets near perihelion. Thus, newly introduced comets from the Oort cloud replace older, long-period comets that burn out. About the same time as Oort's work, Gerard Kuiper offered his Kuiper belt, a hypothetical distribution of comet nuclei orbiting the sun just beyond Neptune, as a source of short-period comets. I have previously reviewed the Oort cloud and the Kuiper belt (Faulkner, 1997).

Regarding Brown's quote, he stated that the 50,000 AU figure is in error, and offered reference number 31 on page 287

as support. That reference is to a book by Sagan and Druyan (1985, p. 201) and reads:

Many scientific papers are written each year about the Oort Cloud, its properties, its origin, its evolution. Yet there is not yet a shred of direct evidence for its existence.

Notice that this reference does not mention the 50,000 AU figure, but rather it is an acknowledgement that there is no direct evidence for the Oort cloud. Sagan certainly did not believe that the 50,000 AU figure was in error, so what Dr. Brown claims here is very different from what Sagan wrote.

Notice that Brown dismisses the possibility that the sun's mass could have such large error. Actually, the statement that the hidden mass is "probably not in the planetary region" is a gross understatement. We can compute masses using the generalized statement of Kepler's third law of planetary motion,

$$r^3 = (GM/4\pi^2) T^2,$$

where r is the semi-major axis of an orbit, T is the orbital period, G is the universal gravitational constant, and M is the mass. As Brown (2008) correctly points out in footnote 86 on page 292, since we do not know the precise value of G , we actually compute the product GM , rather than M . We can apply this law to the earth's orbit around the sun. In 1900, the earth's orbital period was known to 13 significant figures; it is probably known slightly better today. According to *Allen's Astrophysical Quantities* (Cox, 2000), we know the earth's semi-major axis to 11 significant figures. Applying differentials to the above equation, we can see that an error of Δr in r will affect the error in M , ΔM , as $3 \Delta r$, and that an error in T , ΔT , will affect the error in M as $2 \Delta T$. Since r is known less precisely than T , the error in r will dominate the error in the mass of the sun. Thus, the error in the mass of the sun is on the order of one part in 10^{11} , eight orders of magnitude less than Brown's "17 parts in 10,000."

This point is significant, for Dr. Brown's calculation of a 0.17% error in mass determination, found in footnote 85 (Brown, 2008, p. 292), is based upon the sun's mass being in error, a possibility that he immediately dismisses in the text. The inclusion of this figure from an admittedly irrelevant computation is extremely misleading, amounting to a bait and switch. One could easily conclude from the text that this minimal mass error of 0.17% applies to the discussion of a possible mass distribution 40 – 600 AU from the sun. Let us do a simple calculation of how much mass would be required.

First, let us consider no significant mass distribution outside of the sun. In this case, the potential energy is

$$U_1 = -GmM/r,$$

where M is the mass of the sun, and m and r are the mass and

distance of the comet from the sun at some time. The total energy will be

$$E_1 = K_1 + U_1,$$

where K_1 is the kinetic energy. Now let us consider a second case where the sun is surrounded by a thin shell of radius R and having mass M' . In similar manner, let us call the respective energies of case two E_2 , K_2 , and U_2 . The potential energy U_2 is a bit more complicated than U_1 . It has the form

$$U_2 = -GmM/r - GmM'/R \quad r < R,$$

$$U_2 = -Gm(M + M')/r, \quad r > R.$$

Since we are considering a very long-period comet, the comet will pass between the two domains of this potential. As usual, $E_2 = K_2 + U_2$. Note that in the domain $r < R$, the two kinetic energies will be the same. That is,

$$K_1 = K_2 = K \quad \text{for } r < R.$$

This fact will allow us easily to determine the difference between the total energies E_1 and E_2 . Evaluate the energies just inside $r = R$ and take the difference:

$$E_1 - E_2 = (K - GmM/R) - (K - GmM/R - GmM'/R) = GmM'/R.$$

While the potential energies of the two cases differ and the kinetic energies differ for $r > R$, this difference between the two total energies will remain constant.

To find the perihelion distances of the two cases, we note that $K = 0$ at aphelion. Let a_1 be the aphelion distance of case one. We find

$$E_1 = -GmM/a_1.$$

Similarly, we find that if a_2 is the aphelion distance of case two that

$$E_2 = -GmM/a_2 - GmM'/a_2.$$

We note that $a_1 > a_2$, so we can evaluate the energy E_1 at $r = a_2$:

$$E_1 = K_1 - GmM/a_2,$$

where K_1 is the kinetic energy of case one at the position $r = a_2$. Taking the difference between these last two expressions and

setting it equal to the difference between E_1 and E_2 previously found, we find

$$E_1 - E_2 = K_1 - GmM/a_2 + GmM/a_2 + GmM'/a_2 =$$

$$GmM'/R$$

which reduces to

$$K_1 = GmM'(1/R - 1/a_2).$$

We can find an alternate expression for K_1 by evaluating $K_1 = E_1 - U_1$ at $r = a_2$:

$$K_1 = -GmM/a_1 + GmM/a_2,$$

where we have substituted $-GmM/a_1$ for E_1 as previously found. Equating these two expressions for K_1 , we find, after some algebraic manipulation:

$$M'/M = (R/a_1)(a_1 - a_2)/(a_2 - R).$$

This expression relates the ratio of the mass of the hypothetical shell to the mass of the sun and the radius of the shell and the two aphelia distances of either case. Since Brown suggested a shell having an inner radius of 40 AU and an outer radius of 600 AU, let us take the average, 320 AU, for R . Brown (2008) used 50,000 AU for a_1 and 585 AU for a_2 . Using these values, the mass ratio is 1.19, which is 700 times more massive than the 0.17% mass error that Brown claimed. The table displays values of the mass ratio for various values of R , in AU, keeping the aphelia the same.

R	M'/M
40	0.07
100	0.20
150	0.34
200	0.51
250	0.74
300	1.04
400	2.14

The closer the mass distribution is to the sun, the less mass that distribution needs. However, the closer the mass distribution is to the sun, the more easily it would be detected. Assuming what appears to be the minimum shell radius $R = 40$ AU would require a mass about 70 times that of Jupiter in the vicinity of Pluto. This is nearly a million Pluto-sized objects. We have modeled a thin shell here; a more realistic model would be a shell with some thickness. That would offer an ad-

ditional parameter for a varying density in the shell. However, this would still not account for the much greater amount of mass required by Brown's model. While a yet undetected mass distribution could account for very long-period comets, until there is some evidence for the mass, this is nothing more than special pleading on Brown's part.

There are other restraints to consider. Many believe that the Flood was more recent than 5,000 years ago (such as the Ussher chronology). This would increase the mass required. Furthermore, comets of extremely long period have not just recently begun to show up; they have been known for centuries and probably even for thousands of years. If extremely long-period comets were seen in, say, Roman times (as appears to be likely), the time constraint would be far shorter and the required mass correspondingly increased.

In supporting his claim of extra solar system matter, Dr. Brown notes twelve strange pairs of comets in an essay on page 273. His Table 14 contains orbital information of the twelve pairs. Within each pair, the inclination, the argument of perihelion, and the argument of the ascending node are very similar, and one can easily see the similarity within each pair. One could easily conclude that the two apparitions in each pair are the same comet. However, the orbital periods of the comets in each pair generally are so long that one would not normally expect to see such a quick return (the time between apparitions of a pair is as little as a century, but most of the periods are at least hundreds of thousands of years). Brown suggests that each pair is indeed the same comet but that the actual orbital period has been greatly reduced by a circum solar system cloud of matter.

There are at least three problems here. First, if each of these pairs of comets is indeed only one comet that has returned after about a century, then this must further constrain the extra solar mass required to return these comets so quickly. As previously discussed, Brown (2008) argues that long-period comets must have periods of less than 5,000 years, but for these comets to return in only a century, the extra solar mass must be far greater than he has suggested. This fact seriously undermines his calculated figure on the extra solar mass.

Second, Dr. Brown has been very selective of his pairs. There are many such pairs and even multiple comets with similar orbits. Of particular interest are the Kreutz sun grazer comets. As the name suggests, these comets have perihelia very near the sun. The comets of the Kreutz family have very similar orbital elements. Notable members of this family include the great comets of 1843 and 1882 and Comet Ikeya-Seki, seen in 1965. The SOHO spacecraft recently has discovered many very small members of this group as well, though most of those bodies are so small that they do not survive perihelion passage. All of these comets share common orbital parameters. Dr. Brown is very selective in that he did not include the great

comets of 1843 and 1882 and Comet Ikeya-Seki in his list of comet pairs, even though they share orbital parameters as well. He established his criterion for identifying two supposedly different comets as being one as having similar orbital elements. Yet even when a comet pair meets the criterion, he appears to reject their identification as a single comet solely on the basis that the two comets are too closely spaced in time to fit his model. Once one accepts that at least one comet pair (and the Kreutz family has many members) is not the same comet, then that seriously undercuts his argument about other pairs being the same comet.

A third problem with Dr. Brown's comet pairs is that while the pair members share common inclination and arguments of perihelion and ascending node, the perihelion distance is sometimes quite different. This is particularly true of the third, fourth, fifth, and ninth pairs. Perihelion distance probably is the most difficult of the orbital parameters to alter by a single pass through the solar system, so it is difficult to believe that some of the supposed identical comets are in fact single comets.

Hydroplate Theory of Comet Composition

Comets contain a large amount of water ice, along with ices of various other substances, such as carbon dioxide and methane. Mixed with the ice is a great amount of microscopic particles that we call dust. Dust consists of rocky material, so while the ices would normally melt on earth, the dust would not. Dr. Brown makes a number of claims about comet composition that he says only the hydroplate model can explain. For instance, he states,

Comets contain methane and ethane. On Earth, bacteria produce almost all methane, and ethane comes from methane. How could comets originating in space get high concentrations of these compounds? (Brown, 2008, p. 270).

Brown (2008) essentially argues that since methane on earth normally is biogenic, then the great abundance of methane in comets must necessarily be biogenic as well. Since in the hydroplate model, much material was removed from the earth at the time of the Flood, cometary methane originated on the earth. There are several points to make here. First, as implied in the quote above, not all methane is biogenic. In fact, some scientists, such as the late Thomas Gold, argue that much of the earth's natural gas (methane) is abiogenic. Methane is found in the ISM (many light years from earth), much too far away to have been contaminated from the earth, so interstellar methane appears to be abiogenic. Methane is found in the atmospheres of the Jovian planets, but Brown (2008) does not claim that the Jovian planets formed from material that came from the earth. Methane is abundant in the atmosphere of Titan, the largest satellite of Saturn, and there is good reason to expect much methane on the surface of Titan. He does not

appear to believe that Titan originated from material ejected from the earth, so he should address the origin of methane on Titan. He could argue that Titan and the Jovian planets were contaminated by collisions of material ejected from the earth, but this would greatly increase the amount of material ejected from the earth.

He makes much of the presence of dust in comets claiming that “dust particles in comets vary in size from pebbles to specks smaller than the eye can detect. How dust could ever form in space is a recognized mystery” (Brown, 2008, p. 270). While some larger, pebble-sized dust likely exists in comets, the preponderance of the dust is in very small microscopic pieces. We can conclude this based upon two observations. First, dislodged dust from a comet nucleus forms a tail that is blown away from the sun by the sun’s radiation. This effect works efficiently only on very small particles, and for the dust tail to be so easily visible requires a tremendous amount of those small particles. Second, rock-sized refractory particles from a comet ought to survive passage through the earth’s atmosphere. The fact that no meteorites from shower meteors (known to come from comets) have been found strongly argues against any significant number of large pieces.

In the above quote, Dr. Brown touches upon a problem in modern astronomy: there is no mechanism whereby solid particles can easily form in the ISM. Thus, astronomers have suggested that much of the dust formed in the atmospheres of red giant stars, where the conditions of the material present, temperature, and pressure might allow for this. Stellar winds and radiation supposedly spread the newly formed dust into the ISM. Some of this dust then supposedly mixed with the hypothetical gas cloud from which the solar system formed. Therefore, the evolutionary theory is that the dust in comets came from the ISM, which in turn was manufactured by red giant stars. Brown (2008) seems to argue here that since it is impossible for dust to form in space, then the dust in comets must have come from the earth. However, dust is even more abundant than methane in the ISM. To be consistent, he should argue that interstellar dust must have come from the earth as well, but that dust is much too far away and far too plentiful to have come from the earth. The best that Dr. Brown can make of this is an argument against the naturalistic origin of dust in space. Yet, the presence of dust in comets hardly constitutes any evidence that the dust came from the earth as his claims.

Brown (2008, p. 270) makes several specific claims about cometary dust that are not true.

In fact, the type of olivine in comet dust appears to be rich in magnesium, as is the olivine in rocks beneath oceans and in continental crust. In contrast, dust between stars (interstellar dust) has no repetitive atomic patterns; it is not crystalline, and certainly not olivine.

It is true at this time that interstellar dust generally does not appear to be crystalline while cometary dust does have some crystalline structure. This is strange, but evolutionary astronomers likely will come to explain this in terms of some reworking of cometary material early in their history – already the status of comets is being reconsidered for other reasons. Of more importance here is Brown’s incorrect statement that olivine is not found in the interstellar dust. Olivine is a silicate containing Mg and Fe. Silicate is very common in the ISM, as evidenced by its spectral characteristics. Determining exactly which form of silicate is in the ISM is difficult, probably because it likely is a mixture of many forms. However, both Mg and Fe are very common elements, so we would expect that at least some of the ISM silicate is in the form of olivine. Furthermore, olivine, and even crystalline olivine, has been found in the ISM (e.g., see Waelkens et al., 1996).

In discussing the Deep Impact mission, Brown (2008, p. 276) states, “The cometary material blasted into space included: a. *silicates*, which constitute about 95% of the Earth’s crust and contain considerable oxygen—a rare commodity in space.”

It is not entirely clear whether Brown means that silicate or oxygen is rare in space. However, it does not matter, for neither is true. Oxygen is the third most abundant element in the universe, and astronomers have long detected it in the interstellar medium. Furthermore, compounds of oxygen, including solid silicate particles and rocks, are common in the universe. For instance, the moon and the three other terrestrial planets likely are rich in silicate rocks. Additionally, silicates are common in the ISM. Thus, as with dust, the presence of silicate material in comets does not demand a terrestrial origin for comets, and he claims that “sodium ... is seldom seen in space” (Brown, 2008, p. 270). Again, this is incorrect; sodium is found in the interstellar medium.

In discussing the Stardust mission, Brown (2008, p. 270) states,

The dust was crystalline and contained “abundant organics,” “abundant water,” and many chemical elements common on Earth but rare in space: magnesium, calcium, aluminum, and titanium.

Again, while some of these elements are depleted with respect to some other elements in the interstellar medium, actually they are plentiful there. Dr. Brown may have misinterpreted what he has read about the depletion of the elements magnesium, calcium, aluminum, and titanium in the ISM. These atoms are detected by their spectra in the ISM, which requires they be in a gaseous (or atomic) form. The depletion likely results from the metals being bound up in the dust in the ISM, thus reducing the amount of these materials available in the gaseous form. Silicates are very common in the ISM, so some of these metals, being common in silicates, must be in the form of dust. Brown (2008, p. 270) continues,

What is “interstellar dust”? Is it dust? Is it interstellar? While some of its light characteristics match those of dust, Hoyle and Wickramasinghe have shown that those characteristics have a much better match with dried, frozen bacteria and cellulose—an amazing match.

The implication of this statement apparently is that since cellulose is biogenic in origin, then the presence of biogenic material in comets strongly suggests a terrestrial origin. Life does not exist in space. There are at least two large problems with this argument. First, Hoyle and Wickramasinghe (1978) were mostly discussing interstellar dust, yet Brown implies that their work referred to cometary dust. Again, if cometary dust must have terrestrial origin, then to be consistent, Brown ought to conclude that interstellar dust has a terrestrial origin (as stated, interstellar dust is far too distant and abundant to be from earth). The other problem is that Hoyle’s and Wickramasinghe’s claim is fairly controversial. There is little, if any, evidence for its support. Furthermore, their position on this subject was an attempt to bolster their theory of panspermia, which is that life originated elsewhere and was seeded upon the earth. Thus, their proposed direction of contamination was in the opposite direction of what Brown claims.

Brown (2008, pp. 270–271) discusses the fact that comets are enriched in deuterium.

Water molecules (H_2O) have two hydrogen atoms and one oxygen atom. A hydrogen atom contains one proton in its nucleus. On Earth, about one out of 6,400 hydrogen nuclei has, in addition to its proton, a neutron, making that hydrogen—called heavy hydrogen, or deuterium—twice as heavy as normal hydrogen.

Surprisingly, in comets, one out of 3,200 hydrogen atoms is heavy—twice that in water on Earth. Therefore, comets did not deliver most of Earth’s water, as many writers have speculated. In comets, the ratio of heavy hydrogen to normal hydrogen is 20–100 times greater than in interstellar space and the solar system as a whole. Evidently, comets came from an isolated reservoir rich in heavy hydrogen. Many efforts by comet experts to deal with this problem are simply unscientific guesswork. No known naturally occurring process will greatly increase or decrease the heavy hydrogen concentration in comets.

Notice that Brown dismisses the evolutionary theory that the earth’s oceans originated from comets on the basis that the deuterium abundances of comets and the earth’s oceans do not match. It would seem that the same reasoning would eliminate the possibility that comets originated from the earth, as in Brown’s model. Brown (2008, pp. 272, 279) addresses this.

Comets are literally out of this world. As the flood began, the extreme pressure in the interconnected subterranean chambers and the power of supercritical water exploding into the vacuum of space launched material that later merged to

become about 50,000 comets, totaling less than 1% of the water in the chambers. (These numbers will be derived later.) This water was rich in heavy hydrogen.

Comets are rich in heavy hydrogen, because the water in the subterranean chambers was isolated from other water in the solar system. Our oceans have half the concentration of heavy hydrogen that comets have. So, if the subterranean chambers held half the water in today’s oceans (as assumed on page 115), then almost all heavy hydrogen came from the subterranean chambers.

This is begging the question. Noting that comets are enriched in deuterium over terrestrial water, Brown is forced to hypothesize that the subterranean fountains were similarly enriched with deuterium in order to explain the deuterium content of comets. This is not a good explanation of the hydroplate model, as this latter quote expands upon an item in Brown’s Table 16 (Brown, 2008, p. 275). How is his explanation of the deuterium discrepancy different from the “unscientific guesswork” of which he is so quick to accuse evolutionists?

Furthermore, the details of this argument are questionable. Measurements of deuterium in space and astronomical bodies are quite variable, even for the same objects. For instance, one study found that the deuterium abundance of Jupiter is 22 ppm (Lellouch, 2001), while another study found 600 ppm (Anonymous, 1996). These values bracket the terrestrial ocean value (154 ppm), as well as cometary values. Therefore, it is not at all clear what one could conclude from this. It could be argued that cometary deuterium came from Jupiter or that Jupiter and cometary deuterium came from the same source, conclusions quite different from those of Brown (2008).

Elsewhere Brown (2008, p. 271) states, “They contain limestone, clays, and some compounds found in or produced by life, such as methane.” As previously mentioned, this contains an implied assumption that methane must be biogenic. Besides this, we must question the description of limestone and clays in comets. While some people have suggested that calcium carbonate may be in comets, that proposal is unclear and still debated. Clay refers to closely packed particles of small grain size. On earth, we think that clay normally results from weathering of rocks and compaction, all through the action of water. Given the porous nature of comets, it is not likely that small, clay-sized particles in comets are compacted sufficiently to resemble anything like terrestrial clays. Furthermore, it is not clear that any such particles must have involved liquid water in their formation, as on earth. In short, inclusion of mention of clay and limestone in comets is misleading at best.

Claims Concerning Comets

Brown (2008, p. 264) holds out comets as special harbingers of disaster.

Fear of comets as omens of death existed in most ancient cultures. Indeed, comets were called “disasters,” which in Greek means “evil” (dis) “star” (aster). Why fear comets and not other more surprising celestial events, such as eclipses, supernovas, or meteor showers? When Halley’s comet appeared in 1910, some people worldwide panicked; a few even committed suicide. In Texas, police arrested men selling “comet-protection” pills. Rioters then freed the salesmen. Elsewhere, people quit jobs or locked themselves in their homes as the comet approached.

And elsewhere, he writes,

Perhaps the founders of different cultures learned from their ancestors that comets were first observed right after the flood, so comets became associated with death and disaster worldwide—hence the word “disaster”: dis (evil) + aster (star) (Brown, 2008, p. 279).

The etymology of the word “disaster” here is correct, but most lexicographers think that it has an astrological connection rather than exclusively applying to comets. While people have viewed the appearance of comets as portends of disaster, they have viewed the other astronomical events and objects with the sorts of bad things that Brown listed here as well. For instance, the Leonid meteor storm of November 12–13, 1833, caused many to think that the end of the world had come. One witness to this was a young Abraham Lincoln (Olson and Jasinski, 1999). Both lunar and solar eclipses have caused people to fear disaster. One example is Christopher Columbus’s threat to Jamaican natives that if they did not bring him and his crew food that the moon would be taken away (Olson, 1992). At first, the natives rebuffed this demand, but when the moon was eclipsed later that evening (February 29, 1504), the fearful natives quickly complied. One rare example of natives using astronomical knowledge against natives is the famous case of Shawnee leader Tecumseh and his brother Tenskwatawa using information about the June 16, 1806 total solar eclipse to bring other Indian leaders into their line of thinking (Marschall, 1979). In passing, I will mention that I have had difficulty confirming that anyone committed suicide during the 1910 apparition of Halley’s Comet; unfortunately, Brown did not reference this.

In discussing the Oort cloud, Brown (2008, figure 150, p. 269) stated,

Mathematical errors led to the belief that a cloud of cometary material, called the Oort cloud, surrounds the solar system. ... All we can say is that 71% of the long-period comets ... are falling in with similar and very large energies.

It is not clear what Dr. Brown means by “mathematical errors” here. Is he referring to the possibility of circum solar system material (previously discussed here) that would greatly reduce the aphelia of what appear to be extremely long periods? If so, this hardly is a mathematical error. Rather it is more of

an error of leaving out something that we do not know about, if one can call that an error.

Continuing with long-period comets, Brown (2008, figure 150, p. 269) writes,

Few long-period comets would survive the many gravity perturbations needed to make them short-period comets. However, there are about a hundred times more short-period comets than one would expect based on all the gravity perturbations needed.

This and other statements suggest that Brown assumes that the evolutionary theory concludes that long-period comets are perturbed by the Jovian planets into short-period comets. However, astronomers generally no longer accept this position. For many years, many astronomers thought that this was possible, but computer simulations done during the 1980s showed that the conversion of long-period to short-period comets was far too inefficient to account for the number of short-period comets (see Faulkner, 1997 for discussion of this, with references to this work). Since then, astronomers generally have thought that while long-period comets originate from the Oort cloud, short-period comets come from the Kuiper belt. It is odd that Brown (2008) barely acknowledges the Kuiper belt, though he does use some of the data normally used to support the Kuiper belt as evidence of a circum solar system cloud of material.

Brown has made much use of some studies that suggest that the earth is continually bombarded by very small comets. This is very controversial, though not many reading Brown (2008) would pick up on this. His point is that these very small comets are found only near the earth and hence do not strike other planets.

What can explain the strange characteristics of small comets, including their abundance and nearness to Earth, but not to Mars? Small comets have never been seen impacting Mars (Brown, 2008, p. 271).

First, the data supporting the conclusion about many small comets striking the earth’s atmosphere are very controversial. Second, absence of evidence does not constitute evidence of absence. The data for the controversial idea of many small comets striking the earth’s atmosphere come from certain satellites orbiting the earth and looking downward at the earth’s atmosphere. While we have placed some satellites in orbit around Mars, none of those satellites have the instruments the earth-orbiting satellites have, which have produced data that have led some to conclude that there are small comets continually striking the earth. With its much thinner atmosphere, any such interaction of small comets with its atmosphere might be very different than on earth. If those bodies passed through the thin Martian atmosphere, the craters produced would be very small and are unlikely to be readily detected. Hence Mars may be pelted by these bodies as much as the earth is, if they are struck at all.

On another issue, Brown (2008, p. 271) states,

Meteor streams are associated with comets and have similar orbits. Meteorites are concentrated in Earth's topmost sedimentary layers, so they must have fallen recently, after most sediments were deposited. [See "Shallow Meteorites" on page 38.] Comets may have arrived recently as well.

The meteoroids in meteor streams are clearly associated with comets. That is, from the measured paths of meteors in the atmosphere, we can compute the orbits that the meteoroids followed around the sun. In every case, the orbits are very elliptical and inclined, the kind of orbits that comets follow. In fact, in many cases we can identify the comets that are responsible for the debris. In other cases we cannot, but that is probably because the parent comet has expended all of its volatiles and no longer exhibits comet behavior. No one has recovered a fragment from a shower meteor. This is significant, for it means that the meteoroids responsible are very small and fragile, just the kind of thing that we would expect from what we know of comets. On the other hand, we frequently find meteorites from sporadic meteors. The measured paths of sporadic meteors in the atmosphere allow us to compute orbits of the meteoroids responsible. We find that those orbits have low eccentricity and low inclination, the kind of orbits that asteroids have. This is significant, because it strongly implies that comets and asteroids are very different bodies, contrary to what Brown states elsewhere. Furthermore, Brown's statement here is irrelevant, because unless comets have changed character tremendously since the Flood, we would not expect to see any meteorites originating from comets in sedimentary rocks.

In discussing a histogram of comet energies, Brown (2008, figure 150, p. 269) states,

As you can see, *near-parabolic comets are falling in for the first time*. Were they launched in a burst from near the center of the solar system, and are they just now returning to the planetary region again, falling back from all directions? If so, how did this happen?

One could question whether near-parabolic comets are falling in for the first time. However, if this is true, as many would agree (and certainly recent creationists), there are other possibilities. For instance, if comets were part of the original creation, then they were made pretty much as they now exist. Apparently, he believes that creationists must look for physical explanations for much of the world, disdaining suggestions from fellow creationists that some aspects of the physical world might date to the Creation Week.

Brown believes that comets had struck the surfaces of other bodies, but most obviously the moon, Mars, and possibly Mercury. For instance, in discussing recent studies that have suggested water frozen on certain parts of the lunar surface and the surface of Mercury, he writes

How could so many comets have recently hit the Moon, and probably the planet Mercury, that ice remains today? Ice on the Moon, and certainly on hot Mercury, should disappear faster than comets deposit it today (Brown, 2008, p. 275, and restated on p. 280).

This is an assertion without support. There are crater floors on the polar regions of the moon (and probably on Mercury) where the sun never shines. The expected temperatures of these regions always are well below freezing, so ice could exist there for a very long time. In 2009, the LCROSS/LRO mission produced evidence that there indeed is water in these perpetually cold regions.

On Mars, comet impacts created brief saltwater flows, which then carved "erosion" channels (Brown, 2008, p. 275).

Why must these be saltwater flows? Since salt is relatively common and so soluble in water, it would not be surprising to find that salt is in alluvial deposits on Mars, but saltwater is not necessary to form erosion channels. Freshwater erosion channels on earth are common. This statement is begging the question.

Claims about Meteorites, Asteroids, Planets, and Satellites

Since Dr. Brown supposes that the matter that makes up comets and asteroids came from the earth, he might expect to find evidence of life in these objects. Proponents of panspermia—that life originated elsewhere and was seeded upon earth—make the same prediction. He references the work of panspermia proponents in stating that "seventy-eight types of living bacteria have been found in two meteorites after extreme precautions were taken to avoid contamination" (Brown, 2008, p. 303).

This is indeed a startling and monumental result, of which I was fully unaware. Brown cites an obscure source (Gerachi, et al., 2001) to support this conclusion. The report was the publication of an oral presentation at a science meeting in Italy. Included with this report is a statement by referees and discussion of those who attended the presentation. The referees stated that they saw the first draft of the presentation scarcely a week before the presentation, and the final draft and illustrations one day prior to the presentation. Despite Brown's statement that extreme precautions were taken to avoid contamination, a very important portion of this discussion was concern about contamination. Quoting from the referees' report,

The section on methodology, essential to ascertain the degree of possible contamination of the samples, is relatively lean, especially in the part concerning the preliminary treatment of the rocks (metamorphites, granitoids and granulites, meteorites). No matter how sterile might have been the operating environment of the biological laboratory, the previous history of the individual samples does not seem to have been investigated thoroughly, thus leaving room for doubt about the true

representativeness of the samples under study. In particular, the first treatment of the samples with the diamond saw could have introduced extraneous (even organic) materials into the intergranular spaces; the subsequent washing with ethanol, followed by brief heating with the Bunsen burner flame might not have entirely removed such materials. Although not criticizing the procedure followed in the biological laboratory (which appears perfectly suitable for the degree of sterility required for normal terrestrial materials), the undersigned referees believe it appropriate to warn the authors about the need to strengthen their laboratory microbes in rocks and meteorites: a new form controls in relation to the possible contamination in a terrestrial environment of the surfaces and intergranular spaces of the extraterrestrial materials... (Gerachi et al., pp. 64–65).

Therefore, there is considerable question as to how much contamination took place. This work has not been published elsewhere, likely because the authors make a fantastic claim that they are not able to substantiate. Brown's use of this controversial material is highly questionable, and its inclusion surely leaves a very incorrect impression upon his readers. Incidentally, the supposed discovery of bacteria in meteorites is not a new story. For instance, 75 years earlier Lipman (1932) claimed to have found bacteria in meteorites.

Brown (2008) also has incorrect statements regarding the composition of asteroids. For instance, he writes,

Question 6: Aren't meteoroids chips from asteroids?

This commonly-taught idea is based on an error in logic. Asteroids and meteoroids have some similarities, but that does not mean that one came from the other. Maybe a common event produced both asteroids and meteoroids (Brown, 2008, p. 298).

This is not an error in logic. The similarities of asteroids and meteoroids include not only composition but also orbital similarities. Besides, this is the same sort of reasoning that Brown used to argue that comets came from the earth. That is, he argued that since comets contain water and small grain particles and that those things are found on earth, then comets must have come from the earth. Instead, this appears to be an error in logic on Brown's part.

Or consider this statement:

Also, what accounts for the meteorite's other contents: potassium, magnesium, iron, and calcium—elements abundant on Earth, but as far as we know, not beyond Earth? (Brown, 2008, p. 303, from the essay, "Meteorites Return Home")

This statement is patently false. Potassium, magnesium, and calcium are found in abundance on the moon. We think that these elements, along with iron are common on Mercury, Venus, and Mars. Iron whiskers are common in the ISM. Furthermore, resonance lines of all four of these metals long have been detected in the interstellar medium

(Draine, 2011, pp. 86–91). It is true that metals in the ISM are depleted with respect to solar and stellar abundances, but this is easily explainable in terms of grain formation, which must necessarily contain these elements (Draine, 2011, pp. 263–284). Potassium, magnesium, iron, and calcium produce very strong absorption lines in the sun's spectrum and in the spectrum of similar stars. In fact, the spectra of spiral galaxies are dominated by calcium lines. The calcium lines in galaxy spectra are the combination of spectral lines formed in the billions of stars that the galaxies contain. The calcium lines are the most common spectral lines used to measure redshifts of galaxies. For instance, Agafonova, et al. (2011) presented a study of three isotopes of magnesium measured at high redshift in the intergalactic medium.

Or consider this statement:

Light spectra (detailed color patterns, much like a long bar code) from certain asteroids in the outer asteroid belt imply the presence of organic compounds, especially kerogen, a coal-tar residue. No doubt the kerogen came from plant life (Brown, 2008, p. 304).

As with statements about comets previously discussed, Brown assumes that organic compounds, especially ones frequently associated with living things, must be biogenic. However, kerogen has been detected in the interstellar medium and in circumstellar clouds. These clouds are much too far away to have been contaminated by material from the earth, so there must be an abiogenic source for kerogen.

In discussing red asteroids, Brown (2008, p. 304) states,

Many asteroids are reddish and have light characteristics showing the presence of iron. On Earth, reddish rocks almost always imply iron oxidized (rusted) by oxygen gas. Today, oxygen is rare in outer space.

It is true, such as with Mars, that red color can indicate the presence of iron oxide. However, other compounds can produce red color, so it does not follow that red necessarily implies the presence of iron oxide. For instance, sulfur on the surface of Jupiter's satellite Io makes it appear red. It is not clear what Brown means by "light characteristics," but the spectra of red asteroids matches the spectra of carbonaceous chondrite meteorites well. The red apparently comes from organic compounds, and most astronomers think that red asteroids are the parent bodies of carbonaceous meteorites. Jupiter's famous Great Red Spot likely is colored by organic compounds too. Furthermore, contrary to what Brown states (as I pointed out earlier), oxygen is not a rare commodity in space.

With the mention of the red color of Mars, Brown (2008, p. 304) writes,

Mars, often called the red planet, derives its red color from oxidized iron. Again, oxygen contained in water vapor launched from Earth during the flood, probably accounts for Mars' red color.

That is a possibility, but there are others. For instance, there is evidence that not only did water once flow on Mars but that there also may have been standing water to some considerable depth (seas). This would allow for oxidation of the surface. Brown (2008) discusses this with a focus on water flow, but he fails to mention water with depth as well. In a figure caption, he writes,

These channels frequently originate in scooped-out regions, called amphitheaters, high on a crater wall. On Earth, where water falls as rain, erosion channels begin with narrow tributaries that merge with larger tributaries and finally, rivers. Could impacts of comets or icy asteroids have formed these craters, gouged out amphitheaters, and melted the ice — each within seconds? Mars, which is much colder than Antarctica in the winter, would need a heating source, such as impacts, to produce liquid water (Brown, 2008, p. 305, caption to Figure 163).

By concentrating on this sort of feature, Brown ignores the numerous examples of branching tributaries on Mars. In the photo that this caption accompanies, there is some branching on the slope walls. This erosion pattern is similar to what one sees on steep slopes in the American Southwest. Even if one were to restrict discussion to amphitheater erosion, as in Grand Canyon, there is much evidence that Mars was once much wetter and warmer in the past, so that a terrestrial origin of Martian water that Brown suggests is not required. Furthermore, recent evidence shows that liquid water may be flowing from underground even today without any kind of impact involved.

In discussing the origin of the satellites of the Jovian planets, Brown (2008, p. 301) writes,

The smaller moons of the giant planets (Jupiter, Saturn, Uranus, and Neptune) are captured asteroids. Most astronomers probably accept this conclusion, but have no idea how these captures could occur.

It is false that astronomers have no idea how these captures could occur (see, for example, Horedt, 1976). It is true that a simple 2-body interaction won't suffice, because two bodies that interact gravitationally will remain in orbit if they are bound to one another but will pass on hyperbolic paths otherwise. There are two ways out of this problem. One way is to modify the 2-body interaction with some additional factors, such as tidal forces, or aerobraking, which we shall see is Brown's preferred method. The other way is to involve a third body. A simple gravitational interaction of two objects is very easy to solve in a closed form, but once a third body (or more bodies) is thrown into the mix, the problem becomes very intractable with too many variables. This is called the *n*-body problem, where $n > 2$. How this works is that as a small body passes close to a massive body, the massive body perturbs the path of the smaller body. If there is a third body (or more bodies) nearby, the perturbations of this extra body can rob the small body of enough energy so that the massive body can capture

the small body into a stable orbit. On the other hand, this interaction can cause the small body to gain energy rather than lose energy, in which case there is no capture. The actual result depends upon the initial conditions, which we have no way of knowing unless we actually observe the capture. Since the Jovian planets have many satellites, some of them quite massive in their own right, *n*-body interaction for the capture of at least some of the smaller satellites is quite plausible. This is the same sort of interaction that Jupiter exerts on comets to shorten (or lengthen) their periods and to populate Jupiter's family of comets. It is ironic that Brown (2008, p. 278) does not recognize this possibility for satellite capture but invokes this for Jupiter's family of comets.

As for aerobraking, Brown (2008, p. 301) continues,

As explained earlier in this chapter, for decades to centuries after the flood the radiometer effect, powered by the Sun's energy, spiraled asteroids outward from Earth's orbit. Water vapor, around asteroids and in interplanetary space, temporarily thickened asteroid and planet atmospheres. This facilitated aerobraking [see page 269] which allowed massive planets to capture asteroids.

This is not supported by the facts. First, aerobraking primarily works to circularize a closed orbit that already exists by lowering apsis, the most distant point on an orbit around a planet. Aerobraking can be used to slow and effectively capture a body, as has been done for spacecraft visiting other planets, but that requires a very carefully planned trajectory. One must question how frequently this could happen naturally with random trajectories.

Second, this works only for bodies that orbit or pass close to the planet's atmosphere. We do not know the thickness of Jupiter's atmosphere, but it is unlikely to be greater than 200 km. At this time, Jupiter has 63 known satellites. The innermost satellite, Metis, orbits at a distance of 127,690 km from the center of Jupiter. Jupiter's equatorial radius is 71,492 km, so Metis orbits more than 156,000 km above Jupiter's atmosphere. To have any effect upon this satellite, Jupiter's atmosphere would have had to have been expanded by a factor of nearly 300. Problems abound here. For example, addition of material to an atmosphere's such as Jupiter's will not appreciably swell the atmosphere. Mass added to the atmosphere will add weight, which will compress the lower part of the atmosphere to cause the lower atmospheric material to liquefy, thus occupying far less volume. Therefore, there would be no noticeable increase in the thickness of the atmosphere. Certainly, the atmosphere cannot magically resume its earlier configuration to hide what once happened, as Brown (2008) suggests.

Another problem is that a capture event normally ought to result in orbits that are very highly inclined and/or have high eccentricity and frequently are retrograde. In fact, this is a point that Brown (2008, p. 310, endnote 44) makes:

The smaller moons of the giant planets tend to have irregular orbits. For example, Jupiter has at least 31 irregular moons, the largest, Himalia, is 150 kilometers (93 miles) in diameter. Their orbits generally have high inclinations and eccentricities. Many are retrograde. These characteristics show that they were captured.

The eight innermost satellites of Jupiter, including Metis and the four large Galilean satellites, have very low inclinations and low eccentricities. Themisto, the ninth most distant satellite from Jupiter, is the satellite closest to Jupiter that has an inclined, eccentric orbit. At a distance of 7,393,216 km from Jupiter, Themisto's average distance from Jupiter's atmosphere always is more than 7 million km from Jupiter's atmosphere, and Themisto never is within 5.7 million km. All the satellites that orbit Jupiter beyond Themisto have highly inclined and/or very eccentric and frequently retrograde orbits, the kind of orbits that likely resulted from capture events. The most distant satellite orbits more than 30 million km from Jupiter. It is absurd to suggest Jupiter's atmosphere ever swelled to produce aerobraking on these satellites, particularly when we recognize the fact that the much closer orbiting, very circular, low inclination orbit satellites would have been orbiting within the very thickest parts of the much expanded Jovian atmosphere. It is obvious that Dr. Brown has not sufficiently worked out any details of his proposed mechanism; else he would have determined these problems. Similar problems exist for the many small satellites of the other three Jovian planets. Generally, it is the distant satellites that have orbits suggesting capture, and the nearby satellites do not.

Miscellaneous Statements

Dr. Brown clearly disagrees with the 2006 decision of the International Astronomical Union (IAU) to demote Pluto's status as a planet, but his argument is poorly reasoned. First, he states that "the IAU had no jurisdiction to change the definition of 'planet' for the rest of the world" (Brown, 2008, p. 26). Founded in 1919, the IAU is the internationally recognized authority for assigning designation for all astronomical bodies. For instance, the IAU has developed rules for naming of features on planets and satellites, naming of asteroids and comets, and nomenclature for just about every other astronomical body. Included with this authority is the classification and definition of objects, including planets. So Brown is wrong in his belief that the IAU has no authority to do this.

Second, Brown implies that the IAU's motivation for reassigning Pluto as a trans-Neptunian object (TNO) is the difficulty in explaining some of Pluto's characteristics in an evolutionary scenario. This makes no sense. Simply calling Pluto something other than a planet does not remove any difficulties. Rather, there are some fundamental reasons why

astronomers no longer view Pluto as a planet that have little, if anything, to do with evolution. See Faulkner (2009) for further discussion of reasons for Pluto's reassignment.

Third, Brown (2008) engaged in an *ad hominem* argument when he testified to how he had Clyde Tombaugh, the discoverer of Pluto, for a professor and what a wonderful man Tombaugh was. Whether Tombaugh was a nice gentleman or not is irrelevant to whether we ought to continue to view Pluto as a planet.

Brown (2008, pp. 30–31) dismisses dark matter on the basis that astronomers devised it in order to salvage the big bang theory. This is incorrect, though it is a very common misconception among recent creationists. For a discussion of this misconception, as well as a general treatment of dark matter within a creationary context, see DeYoung (2000). The first evidence for dark matter came from Fritz Zwicky's discovery of expanding clusters of galaxies in the 1930s. The best evidence for dark matter comes from the rotation curves of spiral galaxies pioneered by Vera Rubin in the 1970s. It was not until the 1980s that cosmologists began to seriously consider the effect of dark matter upon their models. This inclusion is driven by the fact that if dark matter dominates over the mass of lighted matter, then any cosmological model that excludes dark matter could not accurately describe the universe. What may confuse Brown on this issue are recent studies that have attempted to measure the amount of dark matter, albeit within a framework of the big bang theory.

Conclusion

I have identified a number of incorrect statements that Dr. Brown has made concerning astronomical data. I have also shown that many of his inferences and conclusions are incorrectly drawn or are just simply assertions. Thus, there is considerable doubt that the hydroplate model can explain the origin of comets and asteroids. There are many other possibilities within the recent creation framework to explain asteroids and comets, from their origin during Creation Week with little modification since to origin or extensive modification post-Creation Week. The points made here are entirely apart from any judgment concerning the geological and Flood aspects of the hydroplate model. It is desirable that those with expertise in geology will similarly evaluate the hydroplate model.

When I began this study, I had thought that the astronomical issues were tangential to the hydroplate theory, that these easily could be separated from the geology of the hydroplate theory. However, I have come to realize that perhaps the primary motivation for the hydroplate model is to explain solar system phenomena. If this is the case, then it is unlikely that Brown will abandon these aspects of his model.

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Formic Acid: A Significant but Ignored Product in the Miller–Urey Experiment

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Abstract

In 1953 Stanley Miller tested a hypothesis put forward by A.I. Oparin and, later, J.B.S. Haldane concerning the origin of life. The classic experiment is frequently cited in the popular literature and programming as evidence supporting the formation of primitive cellular organisms from polypeptides that self-organized over millions of years. Yet many of the reaction products from Miller's experiment are more problematic for the model than advocates readily admit. Among these is formic acid, reportedly present at about double the combined concentrations of identified amino acids including glycine, alanine, aspartic acid, and glutamic acid. Formic acid can produce a significant negative impact on the formation and stability of components such as a hypothetical polypeptide. Consequently, advocates of the Oparin-Haldane-Miller theory are faced with an acute problem. The present paper explores the reaction chemistry of aqueous formic acid and an imaginary polypeptide assumed to be present in the primordial ocean.

Introduction

Stanley Miller's spark discharge treatment of methane, water, hydrogen, and ammonia continues to be cited as a plausible model that simulates endogenous production of amino acids in the prebiotic world (Fox and Strasdeit, 2009). In subsequent steps, it is believed that this diverse suite of amino acids combined to form high molecular-weight polypeptides, which in turn supplied critical

raw materials to form the first universal common ancestor (UCA) (Fitz et al., 2007). This imagined scenario, known as the "peptide world," draws from Miller's original findings, but precariously so, as our examination will show.

While a graduate student of Harold C. Urey at the University of Chicago, Miller reported a curious experiment that would initiate empirical origin-of-life studies (Miller, 1953). In the short

Science article, Miller discusses the results of exposing ammonia, methane, water, and hydrogen to electrical discharge, which he concludes "may have played a significant role in the formation of compounds in the primitive earth" (Miller, 1953, p. 528).

The apparatus consists of a round-bottom flask attached to a trap simulating the oceanic environment and another flask fixed with electrodes simulating the atmosphere bristling with lightning. Gaseous hydrogen, methane, and ammonia (10, 20, and 20 cm Hg respectively) were charged into the apparatus, and water in the small flask was boiled. This highly reducing composition was

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exposed to a spark discharge produced by a Tesla coil peaking at 60,000 volts.

The mixture was exposed to continuous sparking over a one-week period, resulting in significant observable changes. Miller (1953) reported the presence of “glycine, alpha-alanine and beta-alanine” and tentatively reported finding “aspartic acid and a-amino-n-butyric acid.” He further reported that other amino acids were “undoubtedly present but in smaller amounts” (Miller, 1953, p. 529). He estimated the total yield was in the “milligram range,” and reported “yellow” compounds that could not be extracted with ether (Miller, 1953).

Miller followed this short paper with a detailed, quantitative and qualitative

report of the products obtained through spark discharge (Miller, 1955). Here Miller discloses an array of organic compounds (Table I). One of the most significant reaction products is formic acid. Formic acid (also called methanoic acid, formula HCOOH) is the simplest carboxylic acid. It is toxic and used as a preservative and antibacterial agent. It also occurs naturally, in the venom of bee and ant stings. Miller reported a concentration of 4% formic acid, based upon the amount of methane initially added. In contrast, the total yield of the most abundant amino acids (d,l-glycine and d,l-alanine) were all less than 4%. Miller emphasized the formation of the few amino acids and apparently

considered the additional compound suite (including formic acid) largely a less important detail.

Although not considered in great depth here, it is fair to note that most geologists no longer accept a highly reducing atmosphere, as Miller originally proposed (Johnson et al., 2008). Recent investigators point out that the ancient earth lacked an insulating or protective ozone layer. The absence of the ozone layer would allow high energy UV radiation from the sun to produce oxygen (O_2) and hydrogen (H_2) from water on the earth. Free oxygen would rapidly decompose organic compounds. Proponents of chemical evolution, including Miller, Urey, and Melvin Calvin, admit

Table I (from Boudreaux and DeMassa, 2010)
MAJOR CHEMICAL PRODUCTS IN MILLER’S EXPERIMENT

Chemical Name	Chemical Formula	Symbol	Moles ($\times 10^{-4}$)	Molarity ^a ($\times 10^{-4}$)	pKa ^b	$[\text{H}_3\text{O}^+]$ ^c ($\times 10^{-4}$)
Formic acid	HCO_2H	FA	23.3	47	3.75	29
Glycine	$\text{NH}_2\text{CH}_2\text{CO}_2\text{H}$	Gly	6.3	13	2.34	77
Glycolic acid	$\text{HOCH}_2\text{CO}_2\text{H}$	GIA	5.6	10	3.83	12
d,l Alanine	$\text{NH}_2(\text{CH}_3)\text{CHCO}_2\text{H}$	d,l,Ala	3.4	6.8	2.33	18
Lactic acid	$\text{H}_3\text{CCH}(\text{OH})\text{CO}_2\text{H}$	LcA	3.1	6.2	3.86	9.3
B. Alanine	$\text{NH}_2(\text{CH}_3)\text{CHCO}_2\text{H}$	β ,Ala	1.5	3.0	3.51	9.6
Acetic acid	$\text{H}_3\text{CCO}_2\text{H}$	AcA	1.5	3.0	4.36	3.6
Propionic acid	$\text{H}_3\text{CCH}_2\text{CO}_2\text{H}$	PrA	1.3	2.6	4.87	1.9
(Iminodiacetic acid) ^d	-	-	(0.9)	-	-	-
Total pH						1.8 ^e

a. Reported by Miller (1953; 1955). For example, formic acid is at 0.0023 moles.

b. Based on 0.5L volume, as reported.

c. Calculated at equilibrium. No reactions between components accounted for.

d. This and all subsequent products in amounts too small to be significant.

e. Net pH of all H_3O^+ in solution.

f. Other reported compounds ($< 10^{-4}$ moles each) a-hydroxybutyric acid, sarcosine, formaldehyde, (d,l)-a-amino-n-butyric acid, acetaldehyde, succinic acid, iminoaceticpropionic acid, n-methyl urea, (d,l)-n-methyl alanine, (d,l)-glutamic acid urea, (d,l)-aspartic acid, homoserine2-Me-Ser, B-hydroxy-Asp, ornithine2-Me-Glu, phenyl alanine.

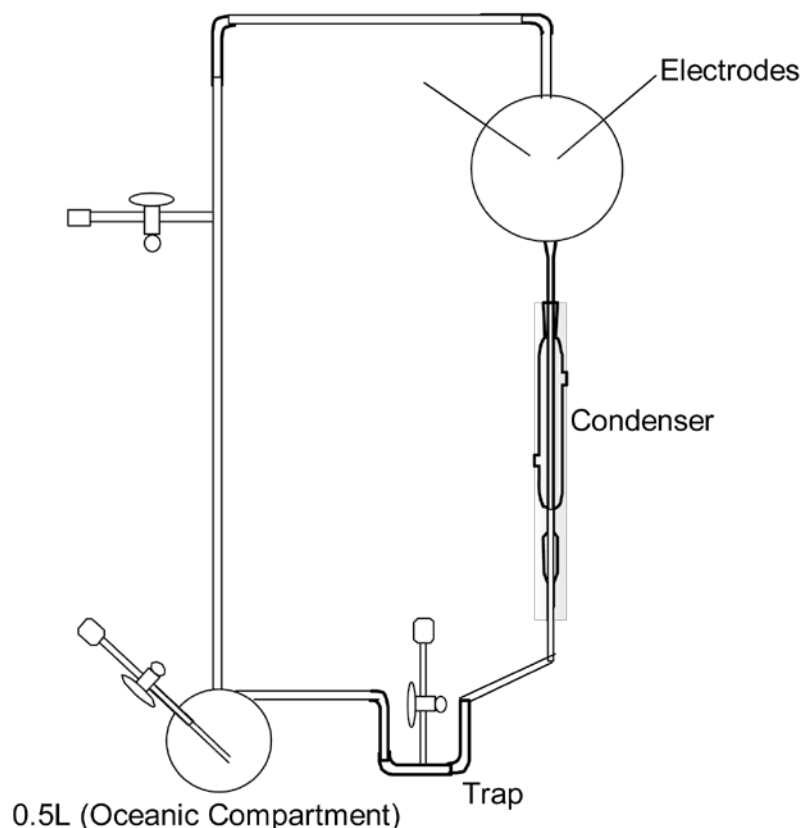


Figure 1. A schematic representation of the Miller apparatus, emulating the synthesis of organic compounds in the supposed prebiotic earth. The circulating mixture passed over tungsten electrodes sparking for one week, consuming 1.5×10^3 kcal of energy. Quantitative and qualitative results were reported for both the gaseous and dissolved components.

that an oxygen atmosphere like ours today would make Miller-type reactions impossible.

Although Miller's experimental conditions are generally considered obsolete, the study's popularity persists. Discussions of his work are still offered as evidence for biomolecule origins in many textbooks (e.g., Chiras, 2012, p. 449–450, Mader, 2011, p. 317, Starr et al., 2009, p. 310), popular media sources (e.g., PBS Report, 1998), and commonly taught in many public schools. Clearly, young students are still being given the impression that this experiment demonstrates natural processes for the origin of life. For example, the Escambia County

School District school district posted sample questions for students taking exams concerning the origin of life. Among these questions was the following (Escambia County School District, 2011, emphasis added):

The Miller-Urey experiment of 1953 was designed to test the hypothesis that lightning supplied the energy needed to turn atmospheric gases into organic molecules such as amino acids. *Which of the following describes why the Miller-Urey theory is widely accepted today?*

A. Amino acids spontaneously form from molecules in the atmosphere today.

B. Organic molecules are present today in extremely high concentrations.

C. The process of synthesizing organic molecules from a mixture of gases has been successfully modeled in the laboratory.

D. No other alternative hypotheses have been introduced.

While the specific approach of the Miller-Urey experiment is not widely accepted today as a valid mechanism, many researchers still offer its results as supportive evidence for the materialistic origin of organic molecules, which subsequently formed the first life forms.

In this light, we need to address another misunderstanding. The experiment's production of formic acid as a major reaction product is frequently ignored. The presence of this formic acid has a potential significant chemical impact on the hypothetical polypeptide that is predicted by the peptide-world hypothesis.

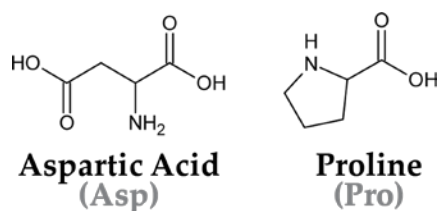
Consequences of Formic Acid Formation

A recent report reexamined Miller's 1953 original samples obtained from a derivative experiment involving injection of steam into the spark (Johnson et al., 2008). In this new analysis, six additional amino acids were discovered. Aliphatic amines were discovered, including methylamine, ethylamine, isopropylamine, and normal propylamine ($< 10^{-5}$ moles relative to glycine = 1). It is uncertain as to whether these products may have formed over the 56 years since the experiments were initiated or if these compounds were formed initially but were below the original detection limits of the equipment used during Miller's time. It is also uncertain whether the original samples in Miller's other experiments, including apparatus 1, may have included these additional compounds. However, for completeness we will list these new findings. Formic acid and

other simple acids were not evaluated in the reexamination, so their concentrations are unknown (Jeffery Bada, 2009, personal communication).

If Miller's reaction mixture is representative of the primordial soup, formic acid not only would have inhibited polypeptide formation (amino acid condensation), as thermodynamic treatments have shown (Boudreaux and De Massa, 2010), but also would have actually inhibited peptide formation even in the presence of selected condensing agents thought present on the early earth (Chang et al., 1969).

Assuming polypeptides were present at some time in a Miller-type soup, the formic acid is such an effective protein denaturant that the polypeptides would have depolymerized in the presence of formic acid. Workers have shown that treatment of common fodder, such as maize with formic acid, leads to a significant increase in free amino acid (Fairbairn and Phillip, 1992). One study discusses fragmentation between a prolyl (proline) and aspartyl (aspartate) linkage of a large protein (Anders and Consigli, 1983). Ring et al. (1972) identified both amino acids in spark discharge reaction mixtures. This is an important point regarding the stability of a hypothetical polypeptide, discussed below.



The protein was heated at 37°C for 24 hours using 75% formic acid (25% water) (Figure 2).

Akiya and Savage (2004) believe formic acid promotes spontaneous hydrolysis (water cleavage of the peptide bond) at the site of the proline nitrogen atom (Figure 3).

Less aggressive acids catalyze hydrolysis reactions as well. For example, us-

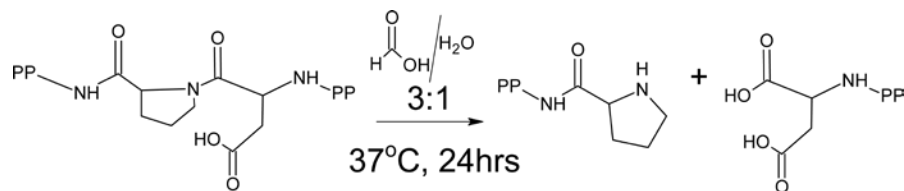


Figure 2. Hydrolysis of Pro-Asp linkage in aqueous formic acid mixture.

ing fairly mild conditions, proteins have been digested with formic acid (Hua et al., 2006). In another study, hydrolysis of peptides occurred in 5% formic acid solution at 37°C for 6 hours (Funatsu and Taguchi, 1988). This work suggests that at the very least, formic acid would have been highly disruptive to polypeptide chain stability in a primordial soup (or lagoon) containing adjacent amino acids like aspartate and proline.

In yet another study, formic acid/water mixtures (pH 2, near the calculated pH of Miller's mixture, see Appendix) were routinely used to digest proteins containing aspartic acid (Rosenburg, 2005). Smith reports cleavage at Asp-X peptide bonds facilitated by the adjacent carboxylic acid side group. Smith also calls "formic acid a good protein denaturant ... and that low pH facilitates a number of side reactions at the glutamic acid side carboxylic acid residue (Walker, 1994). Arai et al. (1999) found that less acidic pH's (6.0) have also been found to favor peptide hydrolysis.

Kinetic studies explain why glutamic acid (or aspartic acid) facilitates chain cleavage (Joshi et al., 2005). The study suggests that Asp-mediated cleavage involved nucleophilic attack of the side-chain carboxylic acid group on the protonated carbonyl carbon of the peptide bond. Fragmentation of the polypeptide follows with hydrolysis of the terminal anhydride moiety. These findings suggest that a hypothetical polypeptide (or oligopeptide) in a Miller-type broth enriched with formic acid

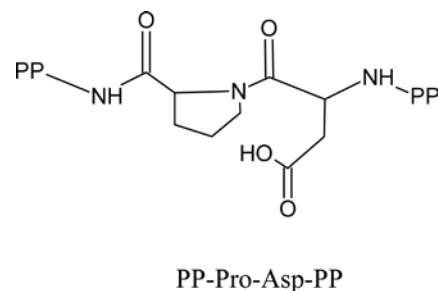


Figure 3. A prolyl-aspartyl linkage in a polypeptide chain (PP).

would similarly fragment (Figure 4). It should also be noted that Miller did not report any peptides such as di-peptides or polypeptides.

Other research has invoked this neighboring group catalysis effect (carboxyl group displacement of the nitrogen of the peptide bond), reducing a tetrapeptide (klerval) to a tripeptide (Won et al., 1999). The findings of Joshi et al. (2005) also suggest how Asp-Pro linkages might rupture in a formic acid enriched environment (Figure 5). In Miller's subsequent work, Asp and Pro amino acids were identified in spark discharge experiments by employing a gaseous mixture of methane, nitrogen, water, and ammonia (Ring et al., 1972).

At least one suggestion drawn from these observations is that a hypothetical prebiotic polypeptide containing amino acid species, such as aspartic acid and glutamic acid (Glu-X, Asp-X, Pro-Asp,

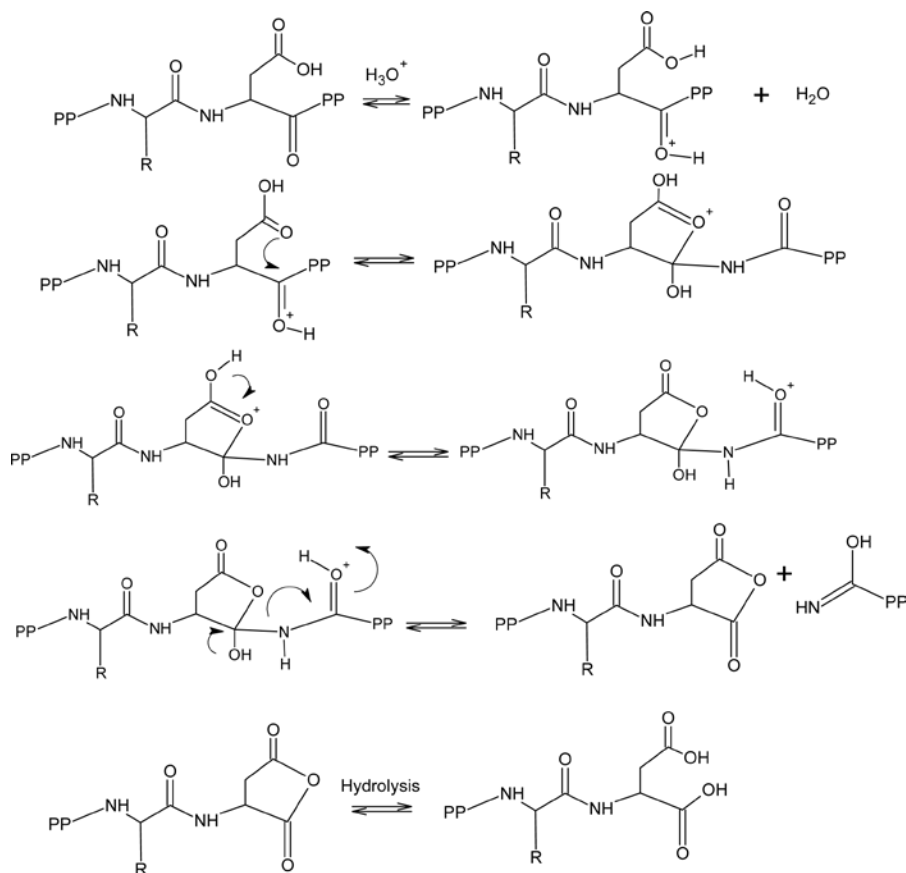


Figure 4. Proposed hydrolysis mechanism of polypeptide chain via Asp neighboring group nucleophilic attack (several steps omitted in anhydride ring opening).

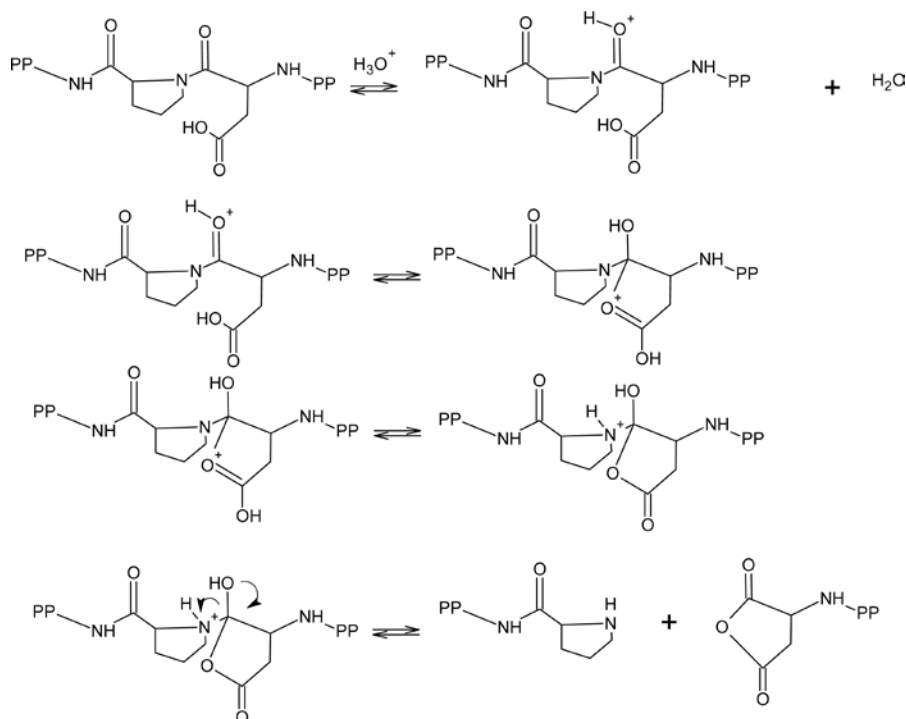


Figure 5. Proposed mechanism of hydrolysis for Pro-Asp linkage.

where X is an adjacent amino acid), both of which were formed in Miller's spark discharge experiments, would hydrolyze in the presence of formic acid. The neighboring group effect would enhance chain fragmentation. It is likely that formic acid would promote cleavage reactions elsewhere on a hypothetical polypeptide chain. This would have been further assisted by other Miller diacid compounds incorporated into the chain (e.g., iminodiacetic acid, Table I).

Conclusion

Although the reducing atmosphere on earth required for Miller's scenario is no longer accepted by geoscientists, Miller's discovery of amino acids continues to be offered as support for the Oparin-Haldane origin-of-life hypothesis (Miller et al., 1997). A PBS Report (1998) states,

Miller's work showed that compounds necessary for life could have been formed in an environment without free oxygen, confirming Haldane's theory. The creation of amino acids from Earth's raw materials may well have been the first step of evolution. It also opens the possibility (since the proposed atmosphere was based on proportions of elements in the universe) that similar atoms and amino acids could have formed elsewhere, on planets formed in the same manner as Earth.

Ignored in these considerations is the impact of various reaction products, such as formic acid, on subsequent hypothesized chemical events leading to the hypothetical proto-cell (i.e., the universal common ancestor).

As we have shown, the highly acidic environment in Miller's "soup" (neglecting potential degradation due to other energy sources; e.g., temperature or light) makes a hostile nursery for either developing polypeptides or promoting polypeptide stability. The problem is further frustrated by the presence of neighboring functional groups that as-

sist with chain cleavage. It is therefore altogether unclear how polypeptides could form, or even survive, in this highly acidic milieu.

To produce peptides and maintain them for further chemical evolution, the peptides formed must be isolated from all the cumulated degrading chemicals present in the reaction mixture. This point is also true for the required chiral purity of amino acids and coagents needed to produce a hypothetical biologically active polypeptide. How this isolation could naturally occur can only be the product of speculation and presents a monumental impasse for the hypothesis of chemical evolution.

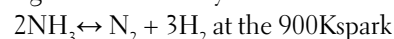
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Appendix

According to Miller (1955) the initial gas pressures were: NH_3 20 cm, CH_4 20 cm and H_2 10 cm in 5.5 L vessel. As the 5L of water were introduced into the vessel and heated to boiling, the total pressure varied from 60–80 cm. Thus water vapor pressure between 10–30 cm was also present in the gas mixture.

From the general gas equation: $PV = nRT$, the number of moles of $\text{NH}_3 = 0.057$ in $V=5.5\text{L}$ and $T = 35^\circ\text{C} = 308\text{K}$. This amounts to 0.011 moles/L. But the NH_3 is subjected to sparking prior to its dissolution in the water, which was subsequently introduced. Thus the following reaction initially occurs:



discharge temperature the approximate value of the equilibrium constant for this reaction is $K_{eq} = 750$, showing that the dissociation of ammonia is very favorable (Miller (1955, p. 2354, Table 1, etc.).

NH_3 provided 10% of the $NH_3 + N_2 + H_2$ mix; hence, when cooled to $35\text{ }^\circ\text{C}$ the NH_3 partial pressure is 50 mm, i.e. $0.1 \times 500\text{ mm} = 50\text{ mm}$ or 0.066 atm. From the general gas equation, the number of moles is $n = 0.0144$ moles in

$5.5\text{ L} = 0.0026$ moles/L. At temperatures approaching the boiling point of water ($90\text{--}100\text{ }^\circ\text{C}$) the maximum solubility of ammonia is about 7%; thus, 0.07×0.0026 moles/L = 1.8×10^{-4} moles/L remain after the reaction.

Considering the aqueous solution dissociation equilibrium: $NH_3(aq) \leftrightarrow NH_4^+ + OH^-$, the molar concentrations are: $[NH_3] = (1.8 \times 10^{-4} - x)$, $[NH_4^+] =$

$[OH^-] = x$ and $K_b = 1.8 \times 10^{-5}$. Solving the equilibrium for $x = 4.9 \times 10^{-5}\text{ M} = [OH^-]$. The total sum of all acids in Miller's mix of products yields $1.6 \times 10^{-2}\text{ M} = [H^+]$ (see Table 1 from a previous paper). Hence, $1.6 \times 10^{-3}\text{ M } [H^+] + 4.9 \times 10^{-5}\text{ M } [OH^-] = 4.9 \times 10^{-5}\text{ M } \{HOH\}$ and the remaining $[H^+] = 1.6 \times 10^{-2} - 4.9 \times 10^{-5} = 1.595 \times 10^{-2}\text{ M}$ (actually $1.6 \times 10^{-2}\text{ M}$), for which the $pH = 1.80$.

The Problem of Amphibian Origins

Jerry Bergman*

Abstract

The fossil and other evidence for the evolution of amphibians from non-amphibians is reviewed, concluding that the first known amphibians were very similar to modern amphibians. All of the major groups of amphibians are evaluated, including frogs (Anura), salamanders (Caudata), and caecilians (Gymnophiona). As far as can be determined from the earliest fossil evidence, frogs, salamanders, and caecilians are morphologically *nearly* identical to modern frogs, salamanders, and caecilians. The implications of this finding for the creation model then are discussed.

Introduction

Amphibians are ectothermic (cold-blooded) vertebrates consisting of frogs (Anura), salamanders (Caudata), and wormlike caecilians (Gymnophiona) (Marent, 2008, p. 20). The term “amphibian” means “double life.” Amphibians are so named because many spend their entire early life in water. As they mature, most amphibians develop lungs and other structures that allow them to live on land. The classic example is a tadpole’s development into a frog (Figures 1 and 2).

This classification is flexible because a few types of animals classified as amphibians develop on land without water, and others live their entire lives in the water. They all lack feathers, hair, and large reptile-like scales, and instead



Figure 1. Frogs in their common habitat. From Brown (1880, p. 146).

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have soft, smooth “skin” that must be kept moist by glands (Noble, 1931). Most adult amphibians have lungs but also can breathe through their skin (e.g. Johnson, 2010, p. 8). As adults, some usually never travel very far from the water; others live their entire life under rocks and logs on high ground or even forests. Aside from these contrasts, the three amphibian groups are very different, despite some similarities.

Frogs, salamanders, and caecilians are very different from one another in skeletal structure and ways of life, both now and throughout their known fossil [history] ... we have found no fossil evidence of any possible antecedents that possessed the specialized features common to all three modern [amphibian] orders.... In the absence of fossil evidence that frogs, salamanders, and caecilians evolved from a close common ancestor, we must consider the possibility that each of the modern orders evolved from a distinct group of Paleozoic amphibians (Carroll, 1988, pp. 181, 182, 184).

For this reason, Northeastern Illinois University herpetologist Ellin Beltz claimed that one of the “big scientific issues now is whether the three groups of amphibians—the salamanders, the caecilians, and the frogs and toads—are all descended from one common fish-like ancestor called ‘Lissamphibia’” (Beltz, 2005, p. 19) or from some other “more or less aquatic tetrapods,” as speculated by Noble (Noble, 1931, p. 2).

Lissamphibia actually is a very unlikely candidate because it is a living fossil that includes all recent amphibians. The problem is the “origin of the Lissamphibia [which] is the subject of continuing debate, and there is no current consensus” (Schoch and Milner, 2004, 345). Darwin speculated that the amphibians descended from a fish “like the *Lepidosiren*,” a South American lungfish (Darwin, 1871, pp. 212–213).

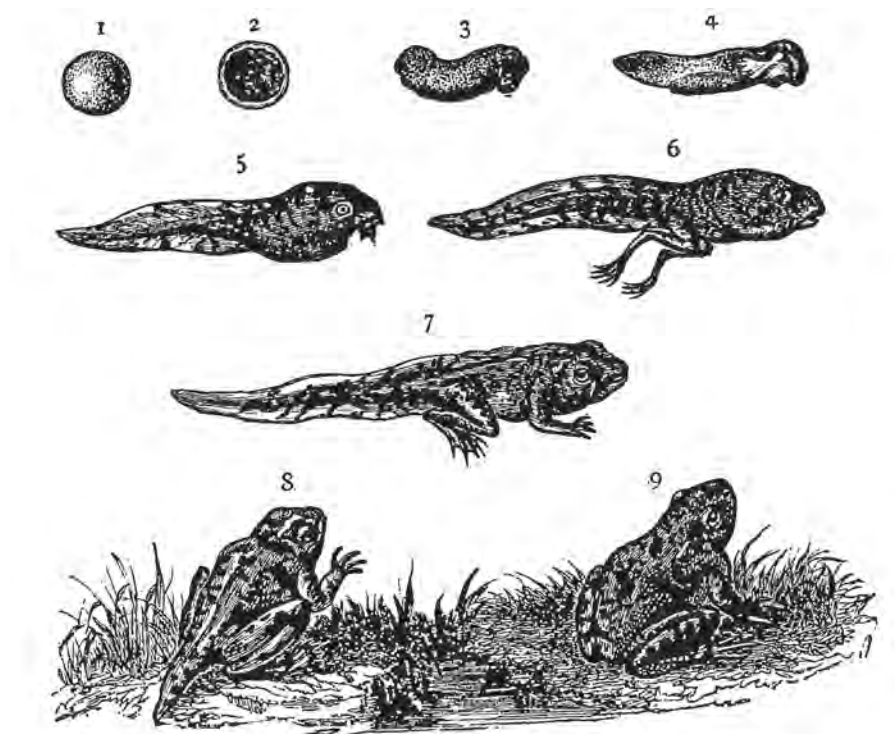


Figure 2. Development of a frog from an egg to a tadpole and finally a frog. From Brown (1880, p. 147).

Since Darwin, the dominant view has been that amphibians evolved from fish.

A common claim is that some fish species developed the ability to climb out of the water, survive on land, and simultaneously evolve the amphibian reproductive system and other common amphibian features. I will show that many hypothetical ancestors of amphibians have been proposed, but specific evidence for any one ancestor is nonexistent.

The Origin of Amphibians from Fish

Most paleontologists agree that the earliest amphibians must have been fishlike. They assume that “tetrapods evolved from a fish ancestor and that amphibians were the first tetrapods” (Gish, 1995, p. 83). Specifically, most evolutionists believe amphibians evolved from a group

of fleshy-finned carnivorous fish about 350 million years ago and they were the first vertebrates to live on land (Johnson, 2010). No fossil fish species yet has been identified as *ancestral* to amphibians; nor has any evidence of an animal “intermediate between the finned and limbed forms” of life been discovered, although many possibilities have been postulated (Stahl, 1974, pp. 194–195).

One suggested possible ancestor is a crossopterygian fish, a conclusion that relies on bone homology based on the fact that the crossopterygian fish pectoral fin bones “are similar to, or homologous with, the humerus, radius, and ulna of the forelimb of amphibians” (Gish, 1995, p. 87). The problem is this:

There the similarity of either the pectoral or pelvic fins of these fishes to the forelimbs and hind limbs of amphibians ceases. There is nothing in any of these fish to equate to

or homologize with hand and feet of amphibians (Gish, 1995, p. 87).

The proposed rhipidistian ancestor, claimed to have skeletal features resembling amphibians, also is problematic. For example, the function of the thick, lobate-paired extinct rhipidistian fin

was very different from the function of the feet and legs of the amphibians. In the rhipidistian fish the humerus (of the front paired fins) and the femur (of the rear paired fins) were held close to the body, which restricted lateral or rotational movement. Thus their fins point in a posterior direction. In the “primitive” tetrapods, however, the limbs are extended forward and away from the trunk during locomotion. The mode of locomotion of amphibians, including the “earliest” or most “primitive” amphibians, was thus drastically different from that of any fish (Carroll, 1988, p. 145).

To evolve from a fish that spends most of its time in the water to a tetrapod that spends most of its time as an adult on land required a radical new respiration system, from a gill system to an air-breathing lung system, and from a finned fish to a four-legged tetrapod that effectively could walk on land. Even the lungless salamanders required an entirely new respiratory system that effectively could take in enough oxygen through their skin to allow the animal to live (Johnson, 2010, p. 39).

Yet another set of radical changes include maintaining proper internal water balance. As the proto-amphibian moved from water to dry land, it would suffer serious water loss through the mouth, lungs, and body surfaces. Significant changes were required in these and other organs and structures to minimize these losses. Furthermore,

curiously, tetrapods and fish move in exactly opposite ways. In fish, locomotion is provided by the body, with the tail propelling the fish through the water. In tetrapods, the legs are

used for propulsion; the longer tetrapod tail is only for balance (Beltz, 2005, p. 20).

The major evolutionary gap between fish and both frogs and salamanders has long been recognized. In comparing

a frog sitting on the edge of a pond with the perches, catfish, or eels in the water, the difference between a tetrapod and a fish seems tremendous. A scrutiny of their detailed structure brings forth such a series of differences in skull, appendages, and breathing apparatus that the change from fish to frog would seem to be one of the most radical steps in the evolution of the vertebrates. This step does not seem less tremendous when we compare the aquatic newt with the fish, for the former is a typical tetrapod which has secondarily taken up a life in the water. It is no wonder that anatomists were puzzled for many years as to how the first tetrapod arose, and even today there is no agreement between those who study only the recent forms (Noble, 1931, p. 2).

The same problem is still with us today. Benton notes that the “major problems” that exist “in moving from water onto the land” include “weight and structural support ... new ways of feeding, of sensing prey and predators, of water balance and of reproduction” (Benton, 2005, p. 75). He then documents in detail each of these problems. Nonetheless, in spite of these problems, paleoanthropologists continue to speculate on the identity of the possible ancestors of amphibians.

Darwinists often describe the extinct fish order *Rhipidistian* as an “ancestral group” to amphibians. Rhipidistians have some skeletal features resembling early amphibians, including those that appear to have evolved into legs. The rhipidistians are known by only a “relatively small number of fossils, many of which show little more than dermal

bones and scales” (Stahl, 1974, p. 146). Stahl added that

none of the known fishes is thought to be directly ancestral to the earliest land vertebrates. Most of them lived after the first amphibians appeared, and those that came before show no evidence of developing the stout limbs and ribs that characterized the primitive tetrapods (Stahl, 1974, p. 148).

Many paleontologists considered the coelacanth to be closely related to the rhipidistians until a living specimen was discovered in 1938. It was expected to shed light on the soft body parts of the putative immediate ancestors of amphibians.

[When] dissected, however, its internal organs showed no signs of being preadapted for a land environment and gave no indication of how it might be possible for a fish to become an amphibian. The experience suggests that a rhipidistian fish might be equally disappointing to Darwinists if its soft body parts could be examined (Johnson, 1993, p. 77).

Other amphibian ancestor candidates include certain Ganoidei fish, a group of mostly extinct, bony fishes characterized by armor-like bony scales, or dipnoan fish, various fish that can respire by lungs as well as gills (Dziewa, 1980), and Labyrinthodontia. All of these claims are so problematic that Benton (2005, p. 79) only briefly covers the problems of amphibian evolution without speculating on any resolution. Order Ganoidei is named after their scale type. Ganoid scales are thick, nonoverlapping, and composed of bone overlaid with an enamel-like substance called *ganoin*. This scale type is most commonly seen in the lobed-finned coelacanth.

All of these proposals are based on certain specific similarities of fish with reptiles or mammals. As Gish notes, all it requires to document amphibian evolution is a few transitional forms to

“reveal what was ancestral to amphibians and what the evolutionary pathway was. Lacking that, all suggestions are mere scenarios and empty rhetoric” (Gish, 1995, p. 85). Thus he concludes that when one critically reads

the massive amount of literature on the origin of major groups, such as the origin of tetrapods ... one soon becomes overwhelmed and confused by the many controversial and contradictory notions of evolutionists. Each espouses his supposedly logical argument based on a comparison of the many characteristics that the theorist assumes to be the most important in selecting the creature believed to be the probable ancestor (Gish, 1995, p. 84).

The same problem still exists today. While Carroll argues for a rhipidistian fish ancestor, other experts advocate for a much earlier ancestor such as a coelacanth-like animal, and still others for some lungfish, as Darwin did. Of all of the known extinct amphibians, all clearly are amphibians, although some are much larger than their modern amphibian relatives; a few as long as 1.5 meters.

Frogs and Toads

Frogs and toads are amphibians in the order Anura (meaning “tailless”: Greek *an-* meaning “without,” plus *-oura*, meaning “tail”). Over 6,000 amphibian species have been identified, and Anurans make up about 90% of the class Amphibia. Most frogs are designed to be able to jump long distances, a movement mode called saltatorial locomotion. This design includes long, powerful hind legs, a short body, webbed fingers and toes, and the absence of a tail—which would interfere with how it jumps (Figure 3). Large, protruding eyes allow them to accurately land on designated targets. Many other frog anatomical characteristics, such as their nervous system and brain, specifically were designed to

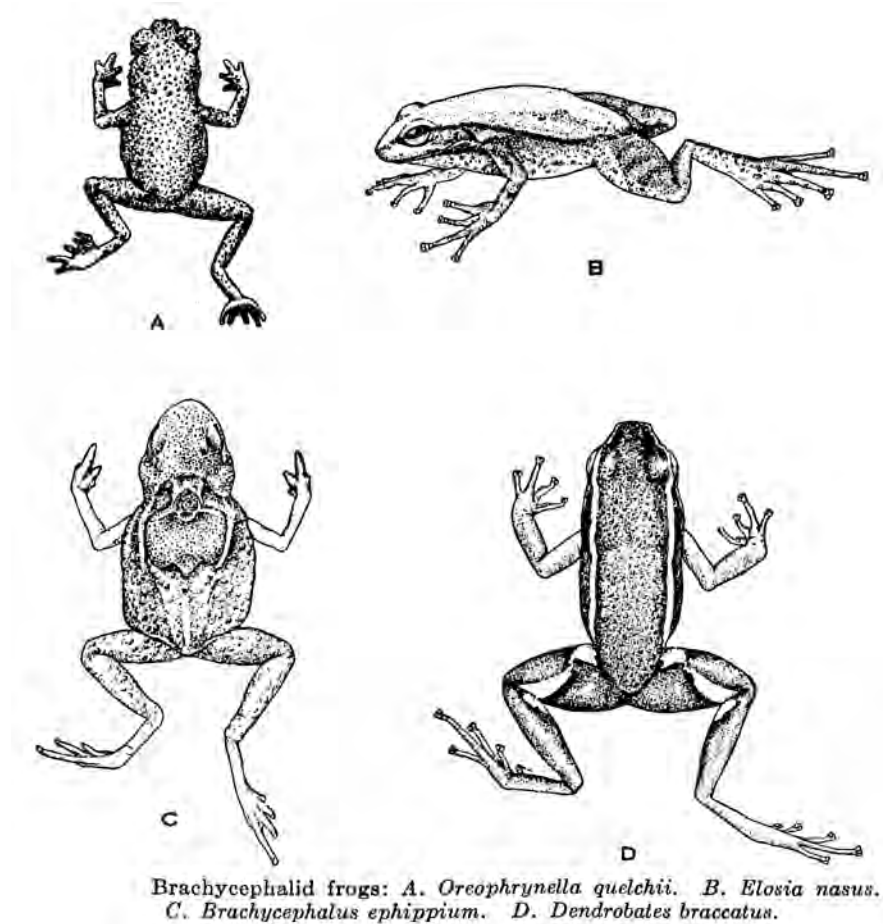


Figure 3. Examples of four of the almost 4,000 species of frogs. From Noble (1931, p. 506).

improve their jumping ability, both their length and their accuracy.

Frog habitats range from tropic to subarctic regions, but most species are found in tropical rainforests. Some frog species synthesize an antifreeze substance that gives them the “amazing ability to freeze solidly in the winter and thaw out in the spring with no harm done” (Holman, 2003, p. 206). Because of their permeable skin, most frogs are semiaquatic or inhabit humid regions, but they can easily move about on land.

Toads are Anurans that have wart-like dry skin, short legs, parotid glands, and other features enabling them to be well adapted to dry environments. The

only family exclusively referred to by the common name “toad” is the genus *Anaxyrus*, North American Toads classified as *Bufonidae*, or *Bufo* in Europe, but spade-foot frogs are also classified as toads.

Frogs typically lay their eggs in mud puddles, ponds, or lakes. Their larvae, called *tadpoles*, are tailed, have gills, and mature in water. The adults lose their tail and gills, and develop lungs needed for living on land. Frogs tend to be carnivorous, consuming mostly arthropods, annelids, and gastropods (see Table I). These small creatures are distinguished by their calls at night during the mating season.

Table I. General Differences Between Frogs and Toads^a

Frogs	Toads
long and skinny	short and stubby
long legs and arms	short legs and arms
long faces	blunt faces
eyes that see up and over to their butts	eyes that see mainly forward with a little periphery
smooth skin	warty skin
not too many wrinkles at joints	sometimes very saggy, baggy skin
not as successful at tongue hunting	extremely successful at tongue hunting—implies better brain power and better resolution on eyesight
“dignified” mating, lay mostly egg masses	massive frothy free-for-alls ending in amplexed pairs stuck for days laying eggs in strings
slower-developing tadpoles	very fast-developing tadpoles
live in lower temperatures and moister places	live in higher temperatures and drier places
most frog species have five toes, jointed 2-2-3-4-3	some true toads (and a few frogs) have only four toes on their hind feet

^aFrom Beltz, 2005, p. 41

Frogs are among the most diverse groups of vertebrates known, and the approximately 6,000 known species are arranged into 30 families (Marent, 2008, p. 20). Unfortunately, populations of certain frog species are declining significantly. The North American green frog is the most familiar type, but frogs come in an amazing variety of vibrant colors, from bright blue to red and even dark or solid black coloration. Many are multicolored, such as black and orange, red and blue, or yellow and red.

Evidence of Frog Evolution

Frog fossils have been found on all continents except Antarctica. Biogeographic data indicates that they once inhabited Antarctica when it had a warmer climate. Extinct frog species exist in the fossil record, but the first frog clearly was a frog. Modern frogs actually are in two major ways less

complex than so-called primitive frogs—“primitive frogs had up to eight rib bones; modern frogs have few or none” and modern frogs have lost their once-short tails (Beltz, 2005, p. 20). They were called primitive because they possessed character traits found in presumed ancestors and not necessarily because these traits were “simple” or “inferior.”

Modern frogs are speculated to have evolved from early temnospondyls, such as an *Eryops*, an animal similar to an overweight alligator and very unlike a frog (Colbert and Minkoff, 2001, p. 96). *Eryops* was as long as almost two meters, as large as many reptiles of the time, and was well adapted to land (Colbert and Minkoff, 2001, p. 108). It had a “large” bony head, strong limbs, a long tail, and rows of sharp teeth in a large mouth. The frog-amander fossil is speculated be an amphibian missing link but lived

a life very much like modern-day alligators, which it strongly resembled (Beltz, 2005, p. 21).

Marjanovic and Laurin (2007, p. 369) concluded: “Review of the paleontological literature shows that the early dates of appearance of Lissamphibia recently inferred from molecular data do not favor an origin of extant amphibians from temnospondyls, contrary to recent claims.” The choice of this unlikely animal as the frog ancestor was partly because a more plausible frog ancestor does not exist. The problem is the first putative frog ancestors left no trace that has yet been found “in spite of paleontologists searching the globe” looking for fossil frogs in ancient rocks likely to preserve animals and plants contemporary to when frog ancestors were theorized to have first evolved (Beltz, 2005, pp. 24–25). The first frog in the fossil record clearly was a frog.

Paleontologists have found a few extinct froglike animals, such as the Early Permian *Gerobatrachus hottoni* (meaning Hotton's elder frog), a frog with salamander-like traits discovered in Texas in 1995 by a Smithsonian field researcher. Only one known specimen of the 12 cm-long animal exists, and this example is very incomplete.

One of the earliest known froglike animals was *Triadobatrachus massinoti*, an early Triassic animal that evolutionists conclude lived in Madagascar 250 million years ago. Its broad skull with large eye sockets and "a nearly modern configuration of the jumping apparatus" are all very froglike (Carroll, 1998, p. 284). The fossils possess several features that are different from most modern amphibians, including their ileum, a longer body with more vertebrae, and separate tail vertebra (modern frogs have fused tail vertebrae). The tibia and fibula bones are also unfused and separate, thus *Triadobatrachus* probably was not an efficient leaper.

Evaluation of its restored skeleton reveals that many "characters (e.g., orbit size, fusion of frontoparietals, morphology of pterygoids and squamosals, etc.) are developed to the same degree as in modern anurans, but other features, mainly in its postcranial skeleton, are very different than modern frogs" (Rage and Rocek, 1989, p. 15). It was likely merely an extinct frog because its restored skeleton looks almost identical to a modern frog skeleton (Rage and Rocek, 1989).

Of the two anuran families known to have lived during the Paleocene (dated by evolutionists 2.3 to 1.64 million years ago), one is extinct and the other is a "modern type" still alive today (Holman, 1998, p. 12). Another example is the "frog-amander" fossil that some claim to be the fish-to-amphibian missing link (Casselman, 2008).

Another fossil frog, *Prosalirus bitis*, called the earliest known anuran, was discovered in 1995 in Arizona's Kayenta

Formation (Jenkins and Shubin, 1998, p. 495). It was dated by evolutionists as the Early Jurassic epoch (190 million years ago). This is somewhat younger than *Triadobatrachus*, documenting that *Triadobatrachus* could not be a transitional form but merely an extinct frog. Like *Triadobatrachus*, *Prosalirus* effectively used saltatorial locomotion but had the typical three-pronged pelvic structure. *Prosalirus bitis* was so modern that Jenkins and Shubin (1998, p. 505) concluded that it "demonstrates that many of the distinctive anatomical features of modern anurans were established by Early Jurassic time."

Unlike *Triadobatrachus*, *Prosalirus* had a small, stub-like tail and was well adapted for jumping. Likely it was an extinct frog. Artists' drawings show that it was unmistakably a frog, as does an evaluation of the skeleton (Jenkins and Shubin, 1998). All fossil frogs dated after this example are recognized by paleontologists as fully modern frogs. One paleoherpetologist pointed to the problem that these frogs are only extinct varieties of frogs and, as has been argued

before and will be again, you need a comparative anuran skeleton collection to be able to make reliable identifications of fossil frogs because of the osteological variations that occur within species. But limitations exist, as seldom do you get an adequate sample of fossil amphibian species (Holman, 2003, p. 207).

The earliest well-documented fully modern frog, *Vieraella herbsti*, has been dated by evolutionists back to the early Jurassic (188–213 million years ago), when dinosaurs were believed to have populated vast land regions. It is known only from the dorsal and ventral impressions of a single animal estimated to be only 33 mm (1.3 in) from snout to vent.

Another modern frog, *Notobatrachus degiustoi*, was dated from the Middle Jurassic, about 155–170 million years ago. Compared to early extinct frogs, the only morphological differences seen in

modern frogs are a slightly shorter body and total loss of the tail. The earliest complete fossil of a fully modern frog is the *Sanyanlichian*, which evolutionists claim lived 125 million years ago and had all modern frog features. Thus, the fossil evidence has documented that the first modern frog, dated by evolutionists as living about 190 million years ago, was fully a frog.

The most accurate method of determining frog evolution is to evaluate the frogs entombed in amber. One example is a frog and a mushroom that were found in Dominican Republic amber dated at 40 million years (Poinar and Poinar, 1994, p. 178). This excellently preserved frog looks identical to a modern frog (Poinar, 1992, p. 216). Also, what looks like a modern tadpole was discovered entombed in amber (see Poinar and Poinar, 1999, p. 155).

The conclusion of these many fossil studies is that frog fauna in North America, the British Isles, and Europe "existed in a state of evolutionary stasis during the entire Pleistocene epoch" (Holman, 2003, p. 206). Furthermore, the evidence reveals that, "other than large tortoises or unique island taxa ... all Pleistocene amphibian and reptile species ... belong to modern species" (Holman, 2003, p. 207). This conclusion is based on the fact that all of the "Pleistocene herpetofaunas that have been documented at numerous sites in continental North America have been strikingly more stable than the mammalian and avian faunas" (Holman, 2003, pp. 208).

Duffett concluded from a detailed study that "fossils of allegedly ancient frogs show that adult frogs have always resembled frogs" (Duffett, 1984, p. 199). Romer's 1966 conclusion is still valid today despite the subsequent discovery of numerous new well-preserved fossil frogs.

Records of late Cretaceous and Tertiary frogs are not uncommon; most are fragmentary and poorly

preserved, and hence often difficult to assign to their proper position in the system of classification. It seems clear, however, that most of the modern families have been in existence since the early part of the Cretaceous. In recent years several good specimens of frogs have been found in the Jurassic of South America and Europe ... Although these finds carry the frog story far back in time, they do not tell us much of frog evolutionary history, for even the “primitive” frog families differ only in relatively minor features from the more “advanced” ones. The basic pattern of anuran structure was already established by the early Jurassic and exemplified by the South American *Vieraella*—essentially a modern frog in its general adaptation, despite its great age (Romer, 1966, p. 100).

He adds that the history of frogs goes back as far as the

Triassic, overlapping the history of the older groups in time, but without closing the morphological gap. In the early Triassic of Madagascar has been found the skeleton of a small animal, *Triadobatrachus* [*Protobatrachus*]. The specimen displays a skull which, although incomplete, appears to be basically similar to that of modern frogs and toads (Romer, 1966, p. 100).

Furthermore, although enormous variety of color, body size, and other features exist, “the adult frog shows remarkable constancy of body plan and general morphology, indicating they all belong to one baramin” (Duffett, 1984, p. 199).

Salamanders and Newts

Salamanders and newts (both family Salamandridae order Urodela) are the second largest group of amphibians (Johnson, 2010). Salamander is the common name for more than 535 amphibian species that are characterized

by long slender bodies, short noses, and long tails (Min et al., 2005) (Figures 4 and 5). Most salamanders have four toes on their front feet and five on their back feet. Some have large feet, others, such as the Olm, have thin, short feet. More than 70 percent are classified in a single family, the *Plethodontidae*, or lungless salamanders (Min, et al., 2005, p. 87). All known fossils and extinct

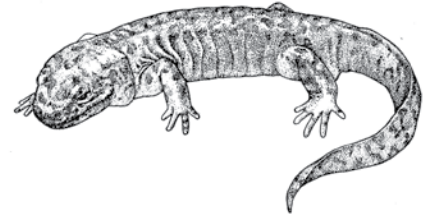
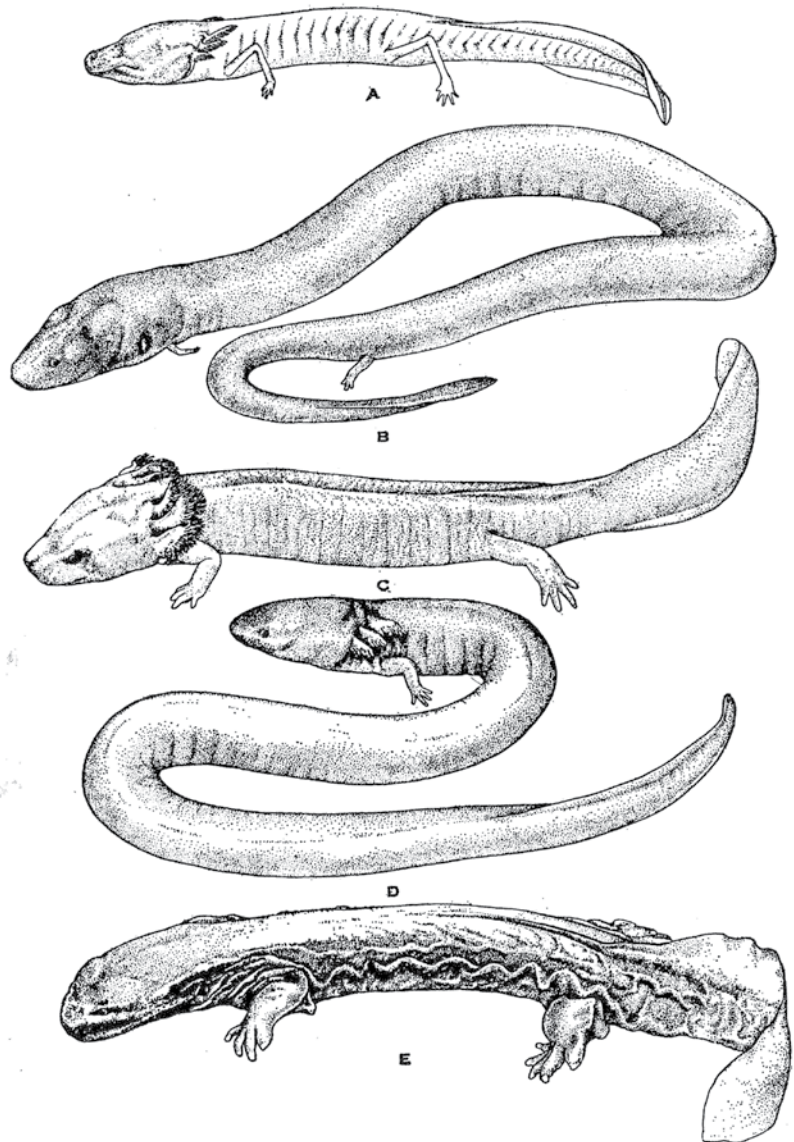


Figure 4. *Dicamptodon ensatus*, the largest living terrestrial salamander, reaching up to 35.1 cm long. It lives in California. From Noble (1931, p. 472).



Permanent larvae: the perennibranch and derotreme salamanders.
A. *Typhlomolge rathbuni*. B. *Amphiuma means*. C. *Necturus maculosus*. D. *Sirena lacertina*. E. *Cryptobranchus alleganiensis*.

Figure 5. Various types of extant salamanders showing the variety. Note example B (*Amphiuma means*) has very small legs, and example D (*Sirena lacertina*) has front legs only. From Noble (1931, p. 470).

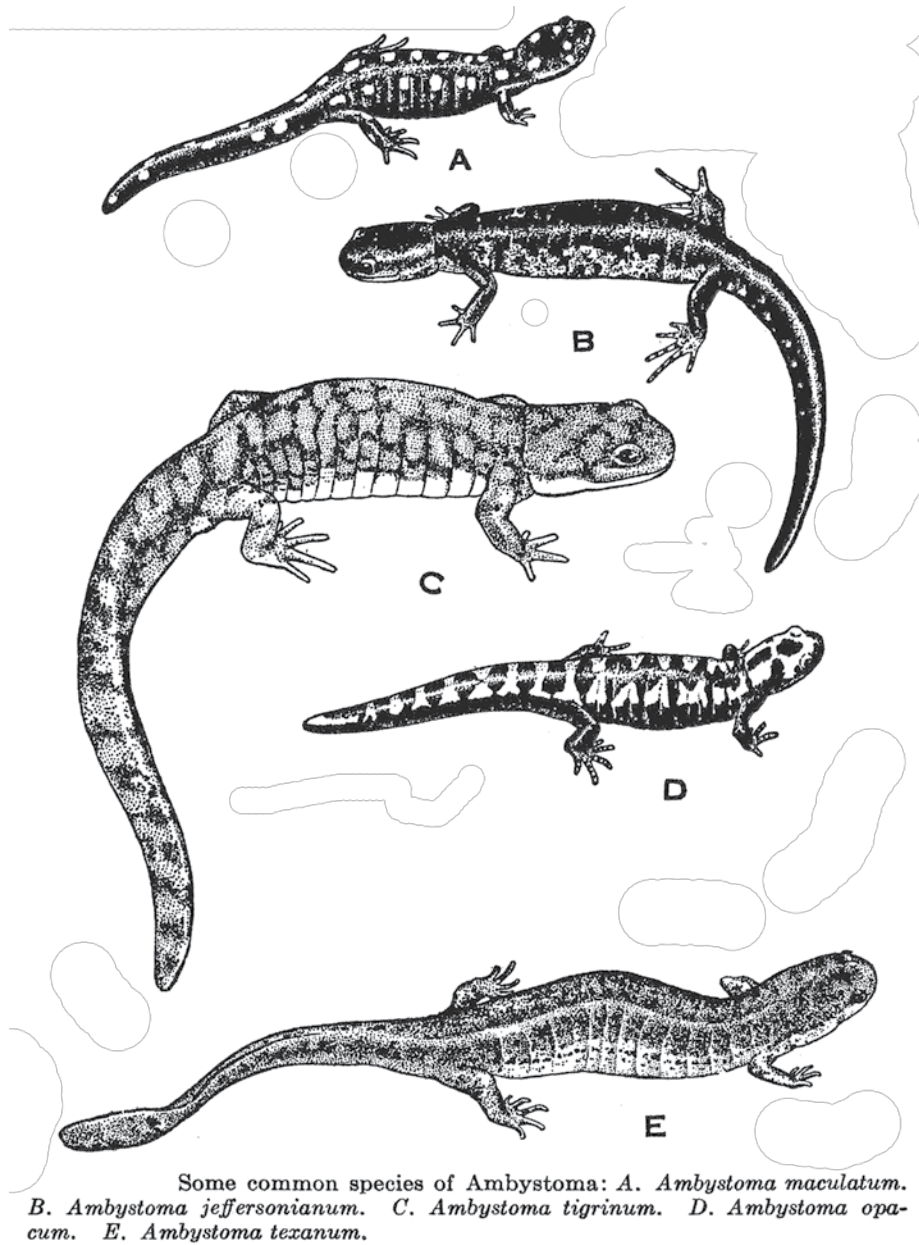


Figure 6. Several common species of *Ambystoma* salamanders, showing the variety of pattern variations in the integument. From Noble (1931, p. 471).

salamander species are grouped in the order Caudata.

Most salamanders lay their eggs in water. When their eggs hatch, they look more like tadpoles than salamanders, and are referred to as “salamander nymphs.” The nymphs have feathery

gills that extend outward from the sides of their necks to help the young salamanders absorb oxygen from the water. Their moist skin requirement forces them to live in habitats in or near water, or in wetlands. Some have lungs, others feathery gills; yet others, such as the

mudpuppy, have larger external bushy gills (Johnson, 2010, p. 43).

Some salamander species are fully aquatic throughout their life; other types take to the water intermittently, and many are entirely terrestrial. Salamanders are unique among all vertebrates because many species can regenerate lost limbs and some other body parts. The strange-looking Axolotl has a long dorsal and ventral fin like a tadpole, and is a popular animal used to research limb regeneration.

Salamander Evolution

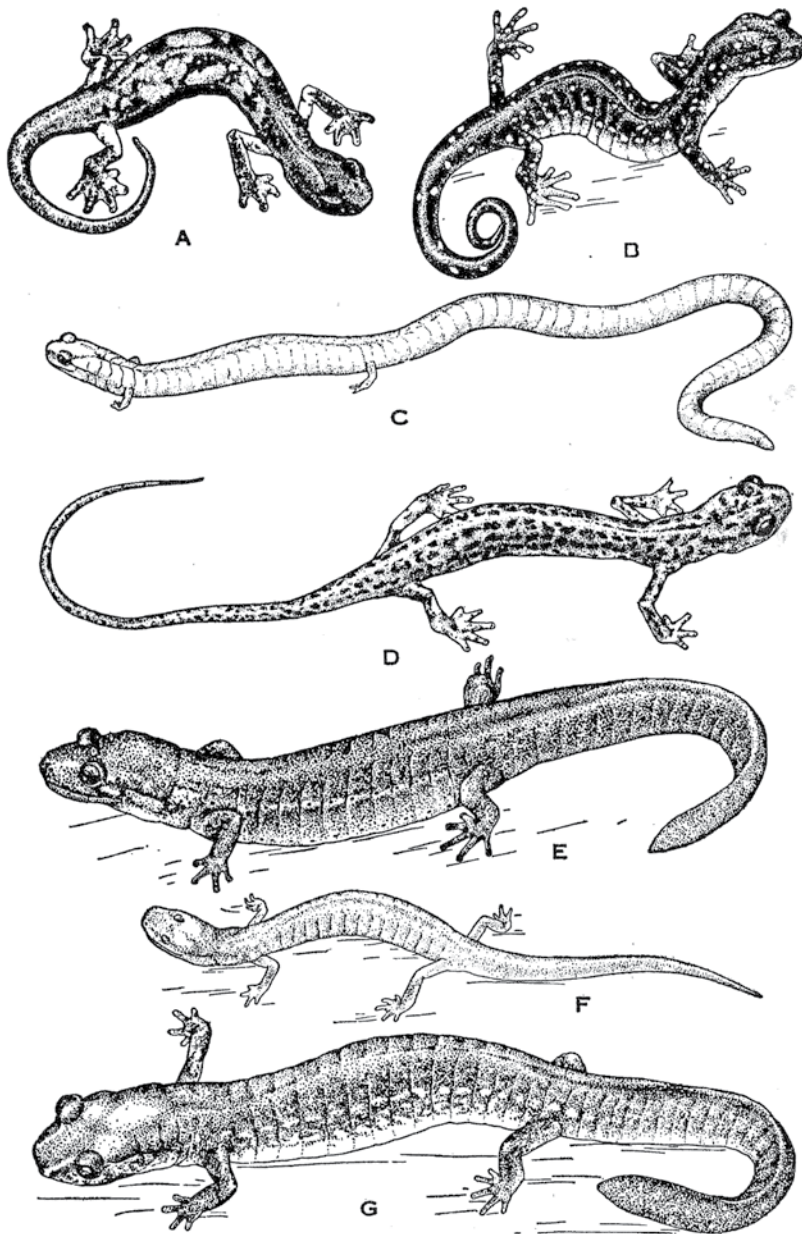
Researchers seldom have “an adequate sample of fossil amphibian species—an obvious exception being the hundreds of specimens of *Ambystoma tigrinum* that J. A. Tihen was able to study in Kansas,” and from these “hundreds of specimens” some conclusions about evolution can be made (Holman, 2003, p. 204). Since Holman’s work, many more discoveries have been made (Figures 6 and 7).

Evolutionists have traced the salamander’s genetic lineage back to more than 110 million years. A team led by David Wake of UC Berkeley’s Department of Integrative Biology (a specialist on the diversity of amphibians who has studied salamander species for nearly 50 years) found that no significant changes have occurred in this 110 million years (Wake and Vredenburg, 2008). Another unsolved puzzle is Asian species of salamanders, which

have only four toes on their feet, while the salamanders of Europe and the Americas all have five. And none of us can think of any reason why four toes would make a salamander species better adapted for survival than five (Perlman, 2006).

To make things more complex, the *Hemidactylium scutatum* salamander has four toes on both its front and hind feet.

Neil Shubin and his colleagues have been collecting thousands of salamander fossils from seven excavation sites in



Plethodontid salamanders: A. *Hydromantes italicus*. B. *Aneides lugubris*. C. *Batrachoseps attenuatus*. D. *Eurycea lucifuga*. E. *Desmognathus quadra-maculatus*. F. *Typhlotriton spelaeus*. G. *Gyrinophilus porphyriticus*.

Figure 7. Plethodontid salamanders, which illustrate the enormous variety, from snakelike salamanders (example C *Batrachoseps attenuatus*) to lizard-like salamanders (example E *Desmognathus quadra-maculatus*). From Noble (1931, p. 478).

China that evolutionists date back to 161 million years, many of which have preserved the entire skeleton and even

impressions of soft tissues. The fossils closely resemble the North American hellbender, a common salamander

found in Asia as well as in the Allegheny Mountains (Gianaro, 2003, p. 2).

Most of the changes in modern salamanders, as compared to fossil salamanders, involve minor differences in the shape of their front skull bones and minor finger, toe, and rib variations. One unique feature is that its “unicapitate” ribs have only one facet or head where they connect to the vertebra—most modern salamanders have two-headed ribs—otherwise they were identical to modern salamanders. Because scientists claim that salamanders have had the same body morphology for millions of years, they are called living fossils.

Despite its Bathonian age, the new cryptobranchid shows extraordinary morphological similarity to its living relatives. This similarity underscores the stasis within salamander anatomical evolution. Indeed, extant cryptobranchid salamanders can be regarded as living fossils whose structures have remained little changed for over 160 million years (Gao and Shubin, 2003, p. 428).

These research conclusions were based on “200 specimens ... many of which preserve evidence of soft tissues” (Gao and Shubin, 2003, p. 426). Shubin adds,

Whether you look at a salamander you find under a rock in the local forest preserve or in a rock in China dating back 165 million years, they look alike. In fact, they look alike in great detail—the bones in their wrists are the same, the way their skulls are formed—intricate details are the same (Shubin, quoted in Gianaro, 2003, p. 3).

This finding is based on “thousands of salamander fossils—many of which preserve the entire skeleton and impressions of soft tissues” (Gianaro, 2003, p. 1). One reason for the

apparent stasis of Pleistocene amphibians may be gleaned from additional studies of modern as well as fossil amphibians. It appears obvious

that ectothermic (cold-blooded) animals, such as amphibians, that have very low metabolic rates and are able to hibernate (in winter) or estivate (in summer) during inclement conditions would have many advantages over endothermic (warm-blooded) birds and mammals during intervals of climatic fluctuations. The ability of many amphibians to freeze solid in the winter, sometimes several times, without dying ... certainly must have been adaptive during the glacial periods of the Pleistocene. In some species of amphibians glycogen from the liver is converted to glucose, which acts as an antifreeze. In others, such as the Old World salamander *Salamandrella keyserlingii*, converted glycerol is used (Holman, 2006, p. 204).

Of course, this only explains how they survived so well in extreme conditions, not how they evolved from non-salamanders by descent with modification as a result of the accumulation of mutations. The problem of “evolutionary stasis in North American Pleistocene Amphibians” also applies to salamanders: “Despite all the Pleistocene stresses that had to be coped with, North American salamanders appeared to exist in a state of evolutionary stasis during the epoch” (Holman, 2006, p. 203). The first salamanders were modern salamanders.

Caecilians

Caecilians (order *Gymnophiona*) are tropical amphibians that have been less studied than other amphibians. They are snakelike organisms with long, legless, and tailless bodies. Externally they strongly resemble earthworms, but they have several clear vertebrate characteristics, including teeth and a unique jaw-closing system (Mauro, et al., 2004). Caecilians commonly are found around swampy locations in most tropical regions, but seldom are seen because of

their underground habitat. Their compact skulls contain recessed mouths and small eyes (Measey and Herrel, 2006). A few species remain aquatic as adults and resemble eels. The approximately 50 known species range in size from 18 cm – 140 cm long and most are about 30 cm long.

Their bodies are ringed with grooves, and some species have small, thin scales embedded in their skin; a feature evolutionists label as a primitive amphibian trait. Grooves on both sides of their head contain a retractable sensory tentacle. Their eyes are nearly functionless, and some species even lack eyes. Caecilians live in the ground and consume small invertebrates such as termites and earthworms.

The phylogeny of the *Gymnophiona* is poorly understood and until recently received little attention (Nussbaum and Wilkinson, 1989, p. 1). The prevailing theory is that they evolved from a four-legged animal “in response to their specialized head-first burrowing lifestyle” (Measey and Herrel, 2006, p. 485). No fossil or other evidence exists for this view, but it is accepted because it is the most plausible theory of the many unlikely evolutionary scenarios (Measey and Herrel, 2006, p. 485). Nussbaum and Wilkinson (1989, p. 1) concluded that “present knowledge does not allow establishment of a robust, phylogenetic classification of Caecilians.”

The first caecilians in the fossil record are found in the Lower Jurassic, and they are very similar to modern forms that have not changed since this time (Beltz, 2005). Savage and Wake (2001, p. 60) noted several theories about their origin, at least the origins of certain species, which they admitted were not based on the relevant empirical evidence.

Hybridization Research

Many new hybridization studies are required to determine monobaramins (Hennigan, 2010). One hybridization

study established that *Linguaelapsus*, *Ambystoma-2* and Mexican ambystomatids are all part of a Salamander Monobaramin (Brophy and Kramer, 2007).

Conclusions

As predicted by creationists, when amphibians first appeared in the fossil record, they were modern and very diverse in structure, just as is true today (Caldwell, 2003; Channing, 2001). This is true of frogs, Family *salamandridae*, newts, and caecilians. Carroll (1988, p. 180) says that when they first appeared in the fossil record, [during the Jurassic] both frogs and salamanders appear essentially modern in their skeletal anatomy. The described fossil record of *Gymnophionans* (caecilians) is limited to isolated vertebrae from the Upper Cretaceous and Paleocene that are very similar to those of modern genera.

According to Colbert, although logical scenarios for frog evolution exist, due to total lack of empirical evidence for their evolution, scientists “can only speculate about” amphibians’ putative “change from an aquatic to a terrestrial mode of life” (Colbert and Morales, 2001, pp. 84–85). The evolutionary origins of frogs lack any clear support in the fossil record, and because “the fossil material provides no evidence of ... the transformation from fish to tetrapod, paleontologists have had to speculate how legs and aerial breathing evolved” (Stahl, 1974, p. 195). Enormous gaps exist in the Amphibia fossil record, and the largest gap is the origin of amphibians (Benton, 2005). Furthermore, most of the amphibians identified in the ancient fossil record are based on a few isolated bones, and thus are subject to revision as more fossils are discovered (e.g., Carroll, 1998, p. 116).

Because the first known frogs are extinct but clearly frogs, evolutionists conclude that the evolution of modern

Anura had ceased during the Jurassic period of history. All frogs dated after this time are clearly modern frogs. In other words, the evidence shows that frogs have not changed during what evolutionists claim was over 200 million years! In conclusion, Colbert and Morales (1991, p. 99) stated,

There is no evidence of any Paleozoic amphibians combining the characteristics that would be expected in a single common ancestor. The oldest known frogs, salamanders, and caecilians are very similar to their living descendants.

The most recent careful evaluation of amphibians has determined that

herpetofauna appears to have been in remarkable stasis since the onset of the Pleistocene, in other words, virtually unchanged for the last 1.64 million years. [Thus], there is no doubt that the herpetofaunas of the British Islands, the European continent, and North America have been strikingly more stable since the beginning of the Pleistocene than the endothermic faunas there. Moreover, this has been documented by hundreds of Pleistocene sites (Holman, 1998, pp. 221–222).

Why “Pleistocene herpetofaunal stasis” exists has not been explained by evolutionists, but they hope that additional fossil studies may hold the answer (Holman, 1998, p. 222). In view of the existing large herpetofaunal fossil record, though, this appears very unlikely. A more recent study concluded,

The relationships of the three extant groups of amphibians (Anura, Urodela, Apoda) to each other, and the identification of their closest Palaeozoic relatives, have been subjects of controversy over the last century. The interrelationship of the modern groups continues to be controversial because neither morphological nor molecular cladistic analyses give a consistent pattern of relationships between the frogs, salamanders,

and caecilians (Schoch and Milner, 2004, pp. 345–346).

This is true in spite of the wealth of evidence obtained (including new fossils and new nucleotide sequences), allowing for a revision of the current evolutionary theories (Kupriyanova, 2009, p. 819).

Creation science, in general, predicts variation within the created kinds but stasis of the created kinds. Further research is required to better document the discontinuity between amphibians and their putative ancestors and the continuity within the amphibian kinds, which likely involves the frog kind, the salamander kind, and the caecilian kind. The discontinuity in the amphibian fossil record is consistent with the creationary predictions of the creation of separate Genesis kinds.

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Upright Petrified Trees of Ramshorn Peak, Montana

Arthur Manning*

Abstract

Two upright petrified trees on Ramshorn Peak, Montana, were examined. One is quite large and located near the summit of this high mountain. The second is unusually tall and is located at a lower elevation. They are similar to those found in the Specimen Ridge area of Yellowstone National Park. Field evidence corresponds with a Flood model, based on observations from the 1980 Mount St. Helens eruption. They were likely catastrophically uprooted, then floated on the waters, and then sank in an upright position, where they were buried and petrified. Finally, they were exposed by the uplift of the land and erosion of the Floodwaters running off in the recessive stage of the Flood.

Introduction

Ramshorn Peak is the highest mountain in the Gallatin Petrified Forest, located in Montana, adjoining the northern boundary of Yellowstone National Park. The altitude at its summit is over 10,200 feet. Vertical petrified trees are found there, like those in the Specimen Creek and Specimen Ridge areas of Yellowstone National Park. Though Gallatin Petrified Forest is not part of Yellowstone National Park, it is still illegal to disturb the petrified trees and stumps there, just as it is in our national parks.

The Ramshorn Peak petrified trees are found in Absaroka volcanics, which are composed of “nearly horizontal lay-

ers of volcanic breccias, conglomerates, and ash” (Hergenrather et al., 2012, p. 59). These volcanics are said to have been “deposited by underwater mudflows and landslides mixed with large angular volcanic rocks” (Hergenrather et al., 2012, p. 71).

Creationists have studied the petrified trees in Yellowstone National Park and have found significant evidence of their formation during the Flood (Arct, 1991; Austin, 1986; Coffin, 1976, 1979, 1983a, 1983b, 1987, 1997). These researchers have proposed that Floodwaters uprooted live trees, stripped off their bark and branches, and waterlogged the remaining trunks, causing them to sink,

many in a vertical orientation due to their heavier base (Austin, 1986). Then they were rapidly buried and later petrified by dissolved minerals. A modern analog was seen at the Mount St. Helen’s eruption of May 18, 1980. The initial blast triggered a landslide into Spirit Lake, and the resulting wave that impacted the opposite shore uprooted hundreds of thousands of large trees. Many of these trees were stripped of bark and branches and formed a giant log mat on Spirit Lake. As they became waterlogged, the trees sank (some in the vertical orientation) to the bottom of the lake (e.g., Coffin, 1997, pp. 30–37). Today there are many upright trees in the bed of Spirit Lake. They are not now petrified, but if they were buried in sediments with the proper diagenetic environment, they would be quite similar to the fossils at Specimen Ridge and Specimen Creek in Yellowstone National Park.

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There was previously a sign in Yellowstone National Park explaining that the petrified trees on Specimen Ridge were the result of growth, burial, and petrification of 27 distinct forests in a uniformitarian manner. These cycles would have required long ages, and the Yellowstone trees were once used as an argument against the creationist position. However, the sign has been removed. Subsequent studies have provided evidence for deposition in an aqueous catastrophe (Arct, 1991; Coffin, 1997).

Other studies (Juby, 2006; Oard and Giesecke, 2007) have shown that similar catastrophic explanations work well for other examples of fossilized trees. Adding to these, this paper will explain how the Flood provides a good model for petrified trees found on Ramshorn Peak in Montana.

Ramshorn Peak

Near the trailhead to Ramshorn Peak at the Tom Miner Campground, a visitor can follow a half-mile interpretive trail that highlights geological features with explanatory signs. One such sign reads, in part:

The rocks in these conglomerate (rounded rocks) or breccia (angular rocks) beds often show reverse sorting (fine to coarse upward) or reverse to normal. The easiest explanation for these textures is movement of rock flows under water. Some of the beds are chaotic (show no sorting). Modern volcanoes rarely leave deposits such as these making it difficult to compare current eruptions with eruptions from the past.

While the sign refers to the geology of the Tom Miner Basin, the same type of geology can be observed as one continues to higher elevations of Ramshorn Peak.

In addition, there are petrified logs in the rocks of the interpretive trail, as well as more in the rocks above the trail. As one hikes up the flanks of nearby Rams-

horn Peak, there are many places where petrified logs can be seen. They occur over an elevation change of approximately 3,000 feet. If these rocks were rapidly and chaotically deposited (as the geology indicates), then the depth and extent of water required to deposit this volume of rock so quickly would seem to argue for the Flood. Furthermore, these volcanic rocks reach much greater thicknesses nearby, often up to 6,000 feet (Hergenrather et al., 2012, p. 59)!

King of Ramshorn

Several of the petrified logs on Ramshorn Peak are notable for their impressive size, and there are some enormous stumps near the 10,000-foot level, not far below the summit. However, anyone wishing to see them should be aware of the extremely hazardous conditions, including steep slopes, sheer cliffs, and loose rocks. The most notable of these stumps (Figures 1 and 2) is an upright specimen measured on August 14,



Figure 1. Large petrified tree near the summit of Ramshorn Peak: “King of Ramshorn.”



Figure 2. Same petrified tree as Figure 1. Grey camera case above white streak near the base of the stump is 7 inches high.

2007. Its dimensions were 11 feet, 2.5 inches high on its upslope side and 18 feet, 9.5 inches high on the downslope side. Its circumference was 28 feet, 11 inches, which means an average diameter of 9 feet, 2 inches. Fisk (1976, p. 54) referred to this tree, which he identified as a redwood, as the “King of Ramshorn.”

Analyzing this tree from an uniformitarian point of view, it is remarkable that such an enormous stump could be found at this elevation (well above the present tree line). In searching the literature, I could find no record of petrified logs at such a high elevation. Perhaps those near the summit of Ramshorn Peak are the highest in the world. Given the elevation, the area had to have been

uplifted to its present altitude after the trees were emplaced.

A Flood explanation would include the following: living trees were uprooted and stripped of bark and branches by Floodwaters, and then floated until they were waterlogged. Once waterlogged they settled into the substrate volcanics or, more likely, were transported by the submarine mud and rock flows, and then were buried. Following this burial, diagenetic processes petrified the logs. The area was then uplifted to its current altitude, possibly during the recessive phase of the Flood. Floodwater retreat also produced massive erosion, which exposed the petrified logs. Minor erosion would have taken place by rain and snowmelt since the Flood.

World’s Tallest Upright Petrified Tree?

A second notable upright petrified tree is also located on Ramshorn Peak (Figures 3 and 4). This tree is at the face of a cliff, well below the summit. Located far from any trail and not visible from any trail, Coffin (1997, p. 14) claimed that it may be the tallest standing petrified tree in the world.

On July 29, 2012, I measured its height as 34 feet, 3 inches. Its base diameter is 2 feet, 11 inches, and the diameter of its upper portion is 2 feet. Its base is at the base of a cliff, and its top extends over ten feet above the cliff. It is pictured in Wilbur and Hansen (1992, p. 180) and in Coffin (1997, p. 14). Coffin (1997) estimated its height



Figure 3. Tall petrified tree on Ramshorn Peak. Photo taken from base of cliff. It is possible to climb into an opening to the right of the tree and pass around to the back of the tree from whence one can look up to the top of the cliff.

at approximately 15 meters (49.2 feet). My measurement showed that it was much shorter, although it is possible that part of the tree was broken off since he obtained his measurements. However, when I compared my photograph of the tree in Figure 3 to the older photos it appeared that it may have lost about a foot,

but certainly not 15 feet. Even so, after a search of the literature, a 34-foot-high petrified tree is about twice as high as any other petrified tree for which I could find a record. Also, it is not possible to determine how deep this tree is embedded in the rocks, so its total length could be more than 34 feet.

Would such a tall tree have floated and been emplaced in a vertical position, or does this indicate that the tree was petrified where it grew? Would the base of such a tree would have been substantial enough to change a floating tree of this height from a horizontal to a vertical orientation? Coffin (1983b, p. 149) provided a photograph of an upright tree (not petrified) that was transported and deposited by flooding associated with the Mount St. Helen's eruption. He states that it was about 30 feet tall.

The tall petrified tree on Ramshorn Peak is most likely visible in outcrop today because of the extensive erosion of the recessive stage of the Flood. Its location along a cliff probably protected the lower part of the tree from erosion, although the part elevated above the cliff would have been subjected to that erosion. Slow exposure of an upright petrified tree by modern-day erosive forces, as assumed by the petrification in situ model, could possibly result in very tall trees being revealed over long periods of time. However, the typical height limit of such trees is about 15 feet, as seen in upright petrified trees at Specimen Ridge and Specimen Creek, as well as in those in Malm Gulch, Idaho, Theodore Roosevelt National Park, North Dakota, and Florissant Fossil Beds National Monument, Colorado (Manning, 2002). A shorter trunk could withstand massive erosion. A taller trunk, however, normally would be toppled over, broken up, and eroded away, or it would be split by such erosion, leaving behind a shorter stump.

So the universal lack of taller upright petrified trees is indicative of the massive erosion of the Flood, not slow, gradual erosion having exposed them. This particular tree would have survived such massive erosion only because of its location at the base of a cliff, with only the top portion of less than 15 feet exposed to the full force of such erosion. Perhaps the top was even higher originally but was broken off by the massive erosion



Figure 4. Measuring the upper portion of the same petrified tree as shown in Figure 3.

associated with the recessive stage of the Flood.

One possible objection to this model for the lack of higher petrified trees might be the argument that this lack would have been due to the process of water freezing in the cracks in the tops of petrified trees, expanding, and slowly deteriorating the tops, decreasing their height. However, this process also would have decreased the height of this high tree to a height of about 15 feet unless this tree was much higher than all the

others to begin with, which would seem to be very unlikely, considering the much greater diameter of other trees that are much shorter. In addition, this exceptionally higher tree's location at the foot of a cliff would have been quite coincidental.

Summary

Anyone contemplating visiting this region should be aware of the dangers mentioned above and travel in a group,

bring enough water, and carry bear spray since this is grizzly bear country. Also, it is imperative to return from any hiking in this area before dark because of the grizzly bears. A safer alternative is to hike up to see the upright petrified trees at Specimen Ridge in Yellowstone National Park. Hergenrather et al. (2012) give more details about this hike.

There are large petrified tree stumps near the summit of Ramshorn Peak. Their presence is best explained by the events of the Flood rather than uniformi-

tarian geology. They are well above the tree line and so could not have grown in situ, unless the area was significantly uplifted after the trees were fossilized. Also, the surrounding rocks apparently were deposited under water at very high rates. Then there was significant erosion afterward that exposed the trees. Another petrified tree lower on the mountain was found to be exceptionally tall. This tree probably was preserved at such a large height because it was sheltered from erosion by the adjacent cliff. Like similar fossils in Yellowstone National Park, these trees on Ramshorn Peak appear to stand in support of the biblical history of a global Flood.

Acknowledgments

I wish to acknowledge, with appreciation, the help and companionship of Brent Carter, Barak Havens, and Nathan Havens in studying these upright petrified trees. Also, the editorial suggestions of anonymous reviewers significantly improved this article.

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Minutes of the 2012 Creation Research Society Board of Directors Meeting

The forty-ninth annual Creation Research Society (CRS) Board of Directors meeting was held 7–9 June 2012, at the La Quinta Inn in Denver, Colorado. The following board members were present: Mark Armitage, Gene Chaffin, Don DeYoung, Danny Faulkner, Robert Hill, Jean Lightner, Gary Locklair, Michael Oard, John Reed (John participated via Skype), Ron Samec, and Glen Wolfrom. Russ Humphreys was unable to attend.

President Don DeYoung called the first session of the general board meeting to order at 19:03 on Thursday, 7 June 2012. Don reminded the members that this is our forty-ninth regular meeting, and he thanked the board members for their time and participation. It was noted that each board member represents over 100 CRS members.

Guest Bob Enyart, pastor of Denver Bible church, was introduced. Pastor Enyart is a strong advocate of right-to-life and creation ministries. He hosts a radio program, *Real Science Friday*, dedicated to providing creation evidence. Fred Williams, the CRS webmaster, is the show's cohost. Bob is a founding member of Rocky Mountain Creation Fellowship group, which is hosting the CRS board meeting this year.

President DeYoung overviewed the logistics of our meeting. The first part of the general board meeting is Thursday evening. Friday is dedicated to committee meetings. There will be a field trip on Friday afternoon to Dinosaur Ridge. A number of CRS members will be presenting for the Rocky Mountain Creation Fellowship on Friday night. The second half of the general board meeting will be on Saturday. Don shared

several letters to the board, including a letter from Erich von Fange (a charter CRS member). President DeYoung shared his thoughts of what CRS should be in five years, and discussion ensued.

Recording secretary Gary Locklair asked for corrections or additions to the 2011 meeting minutes as published in the Winter 2012 *CRSQ*. The minutes stood approved as printed. Gary reported the results of the 2012 board elections. One hundred and eighty ballots were received, and the following were elected to a three-year term: Mark Armitage, Gene Chaffin, Jean Lightner, John Reed, and Glen Wolfrom. A list of future candidates suggested by the membership was presented. Glen Wolfrom was thanked for his work in preparing and mailing CRS ballots to the membership.

Financial secretary Mark Armitage reported that we will likely end our fiscal year spending less than our budget allowed. He reported that our income is down and our investment income was just a little better than last year. Mark believes that our finances are improving, as we withdrew only half of the amount

from our endowment that we did in the previous year. He encouraged the board to reduce the expense budget for next year. Issues related to finances were discussed by the entire board.

Danny Faulkner reported that the CRS has held three successful conferences to date. The planned CRS conference in Southern California was cancelled due to low registration numbers. Danny's hard work in putting these conferences together was recognized by the board.

Mark Armitage shared information from the iDino project that he and Kevin Anderson are leading. Preliminary results indicate the existence of soft tissue in the triceratops material that was recovered recently. Issues related to intellectual property and licensing regarding iDino were discussed.

The first session of the full board meeting adjourned at 20:35

Friday, 8 June, was devoted to committee meetings. The Internet, membership, periodicals, and publication committees met during the first



morning session. The constitution, finance, lab, and research committees met during the second morning session. In the afternoon, the board visited Dinosaur Ridge with Dr. Ed Holroyd as tour guide. The evening meal was enjoyed in fellowship with local CRS members and the Rocky Mountain Creation Fellowship at a local Mexican restaurant. Afterward, CRS members Kevin Anderson, Mark Armitage, Gene Chaffin, Don DeYoung, Robert Hill, Jean Lightner, and Gary Locklair gave presentations at a meeting of the Rocky Mountain Creation Fellowship.

The second part of the general board meeting was called to order at 08:15 on 9 June 2012 by President DeYoung. He thanked members for their participation in the presentations the previous evening at Bethlehem Lutheran Church. He reviewed the agenda for the morning.

John Reed, who has been on the board for 12 years and just moved to Birmingham, Alabama, joined us via Skype to lead the devotion based on Revelation 4:11: "Worthy are you, our Lord and God, to receive glory and honor and power, for you created all things, and by your will they existed and were created" (ESV). John reminded us to continually ask, "Why are we doing what we're doing? What is the purpose and goal of the CRS?"

Because of an invitation from ICR, the 2013 board meeting will be held in Dallas, Texas, on 13–15 June.

The board discussed the position of CRSQ editor. Our current editor, Kevin Anderson, is coming to the end of his term. Kevin has been the eighth editor of the *Q* following Lammerts, Howe, Armstrong, Williams, DeYoung, Chaffin, and Williams.

Internet committee chairman Gary Locklair reported on matters relating to the CRS website, CRSnet, and the CRS Facebook page. A steady growth in the CRS online presence was noted. The online store for the website was updated this past year. The board thanked its

volunteer webmaster, Fred Williams, and his assistant, Tony Massey, for their valuable service to the society. The board commended Glen Wolfrom for his efforts in moderating CRSnet. The board discussed some options related to the use of eBooks as part of our online presence.

Gene Chaffin, periodicals committee chairman, reviewed the status of the editor position for the *CRSQ*, currently staffed by Kevin Anderson. An interim editor has been identified if needed. The current issue of the *CRSQ* is a little late in production. The board commended Kevin for his excellent work on the *Q* and especially for his insightful editorials. The quality of production and content remains high. Gene noted that Glen Wolfrom continues his outstanding work with *Creation Matters*. Bob Hill will serve as an apprentice to Glen for *Creation Matters* with the intention of becoming its editor in the future.

Publication committee chairman Mike Oard reported a change in the wholesale price structure for CRS publications. Mike presented ideas for the production and distribution of eBooks. The current status of several CRS publications were reviewed. Mike noted the need for additional expertise in the area of publishing (both physical and electronic). The committee made two motions. (1) Creation in a Flash will not be updated as scheduled in 2014; instead, all back issues of the *CRSQ* and *CM* will be uploaded to the website for members only. (2) The copyright statement developed by Glen Wolfrom will be added to our website, along with a "permissions" link. Both motions were approved.

Glen Wolfrom, membership committee chairman, overviewed membership trends for the past 10 years. There has been a declining trend in membership since 2007/2008. At the end of 2011/2012 the CRS had 1,626 voting and sustaining members and subscribers. The percentage of new members who renewed after the first year of mem-

bership is still good. We've seen a small growth in student membership over the past three years. The board discussed a number of issues related to membership. As the upcoming year will be the fiftieth year of the CRS, a special seal will be developed for use in promoting the society.

Lab committee chairman Don DeYoung reported on activities at the Van Andel Creation Research Center in Chino Valley, Arizona. We have a new sign, and the campus is in good condition. The greenhouse is full of vegetation too. Don expressed appreciation to the Van Andel family for their support of the VACRC over the years. The iDino project is a unique venture, as its finances are handled by the lab committee rather than the research committee. Don thanked Diane Anderson for her leadership in maintaining the smooth operation of the campus. John Meyer, former board member and lab director, is a good friend who helps out at the campus.

Glen Wolfrom nominated Gene Chaffin for CRS fellow. Gene's nomination was approved unanimously.

During a break in the board meeting, several board members shared a few "lighter moments" relating to creation.

Russ Humphreys was recognized for 20 years of service to the board.

Gene Chaffin, research committee chairman, reviewed the list of active research projects and noted that fewer research proposals were received this year. When the CRS funds research, a publishable paper is expected of the researcher. The committee's work of receiving and reviewing research proposals was summarized. A number of interesting projects in biology, geology, and astronomy were noted. The new research application procedure and form will be added to the website. A request for iDino expenses was referred to the lab committee since it oversees that project.

Constitution committee chairman Gary Locklair reported on ideas for long-range planning and various issues related

to the bylaws. The board discussed a number of options concerning raising awareness of the society.

Treasurer Danny Faulkner presented information about fiscal year 2011–2012. While our financial situation is not great, it is better than in past years. Danny provided estimates of \$227,000 for net income (less transfers of \$30,000 and unrealized gain) versus \$251,000 of expenses for the fiscal year. Our expenses will be less than the approved expense budget of \$287,400 for fiscal year 2011–2012. The board discussed issues related to overhead expenses involved with research donations.

Financial secretary Mark Armitage reported on the society's financial holdings. Mark listed the current value of CRS investments (endowments), which had a modest gain during the past year. The board approved a policy for board member travel reimbursement. Two position descriptions, administrative assistant and assistant to the membership secretary, were approved by the board. A motion was made and approved to allow the executive committee power to reallocate investment (endowment) funds based on the input of our advisor at Raymond James.

Treasurer Faulkner and Financial Secretary Armitage led the discussion regarding the 2012–2013 budget. The following committee budget requests were approved: Research – \$20,000; Periodicals – \$50,000; Publications \$30,000; Membership – \$12,500; Constitution – \$0; VACRC – \$141,150; Finance – \$0; Internet – \$900; Executive/Treasurer – \$15,000.



An expense budget of \$269,550 was approved for fiscal 2012–2013. It was moved and approved to authorize Diane to make a withdrawal from the endowment funds of up to \$20K in order to cover expenses. Any additional amount over \$20K must be approved by the executive committee.

The constitution requires 12 to 18 board members for the CRS. The board submitted the names of Don DeYoung, Gary Locklair, Russ Humphreys, and Ron Samec as candidates for the 2013 board of directors election. There are four openings to be filled. The board discussed several other candidates to be

submitted for consideration next year.

Election of board officers was held. Don DeYoung was elected president, Gene Chaffin was elected vice-president, and Gary Locklair was elected recording secretary. The following were elected for a three-year term: Glen Wolfrom as membership secretary, Mark Armitage as financial secretary, and Danny Faulkner as treasurer.

The meeting was adjourned at 12:20.

Respectfully submitted,
Gary Locklair
CRS Recording Secretary

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.

A Peer-Reviewed Journal?

Dear Editor,

As a physician and educator, I am concerned about the claim that you publish a “peer-reviewed journal.” Science and medicine are obviously not free of bias: anyone who claims not to have a bias on issues that go beyond statistics is mistaken. As an older physician, I am well aware that much of what I once considered “evidence-based” medical practice may be incorrect. My point: good objective science is hard to do and caution is warranted for all readers, whether in medicine or other science fields. In the last 30 years, what I have learned about medicine (and my views of creation) is that humility and honesty are hard to find. Many “peer-reviewed” medical journals are published by well-meaning academic researchers who inadvertently introduce bias (sometimes, but not always, because of support from pharmaceutical companies). I often wonder how these “peer-reviewed” articles get published without more rigorous criticism.

I think it is a misuse of the term to call the CRS *Quarterly* “peer-reviewed.” As you know, this term is most commonly used to describe an editorial process where scientists *with differing perspectives* (peers) criticize submitted articles and publish only those that meet a rigorous standard for quality research and an unbiased perspective. For example, Hugh Ross’s materials from *Reasons to Believe* disclose their bias. The ASA journal makes some attempt at peer review through open critique in its Letters section, but it doesn’t claim to be a “peer-reviewed journal.” Thus, I think CRS should more honestly describe its

commitment to a “young-earth” perspective in the *Quarterly* and the bias of its peer reviewers.

Ideally, what I think peer-reviewed *should* mean is that articles would be critiqued by someone who was not a young-earth creationist. To be practical, I realize this isn’t the goal of the CRSQ. I am just reacting to the term “peer-reviewed,” because I am sensitized by how many medical articles are published that aren’t good science.

I’d love to see the CRS more honestly describe its commitment to a “young-earth” perspective in the *Quarterly* and include a discussion of other biblical perspectives on these issues in some of its materials for laypeople, especially those involved in education.

I am not suggesting that the CRS abandon its principles, commitment to research, or attempts to educate the public. I do, however, think that it’s time for the strong leadership of the CRS to help laypeople have a better understanding that there is a range of perspectives on “creationism” that are held by Christians who have a commitment to the inerrancy of the Scripture. Years ago I tried to keep apprised of the whole scope of what I thought were acceptable/tolerable positions in science, within a biblical view of hermeneutics/Genesis. (I think I burned out in the late 1990s after reading a lot of Hugh Ross’s materials and the vigorous [vehement?] responses.) When ID became widely discussed, I was actively involved in the debate, mostly in the ASA, hoping to get evangelicals to agree that the real issues were with secularists, not within our churches. But most young-earth scientists didn’t seem to spend much ef-

fort on the ASA or consensus building. So, I finally decided to let others try to make this happen.

I keep hoping to see some kind of consensus statements/activities, but I don’t think things have changed much over the years. A consensus statement, initiated by CRS would be very useful. Any hope of this?

Also, correct me if I’m wrong. Are there forums where differing positions have been published among creation scientists (young, old, progressive, ID?). This would be true, peer-reviewed “creation science” in my opinion.

Thank you for your time.

(Name withheld)

Editor’s Response:

From time to time, some of my section editors do, in fact, use evolutionists and non-young-earth creationists as reviewers. However, I disagree that true “peer review” requires using people with widely differing and even contrary perspectives. In the truest sense, the **peers** of members of the Creation Research Society would be fellow members of the Society. I am not aware that, for example, the journal *Evolution* ever uses non-evolutionists as reviewers, let alone routinely.

You are correct; peer review should be a quality critical analysis. So, as an editor, I am seeking reviewers who give the paper a complete and thoughtful critique for the purpose of making it a better paper. I have no reason to believe that I cannot accomplish this by using fellow young-earth creationists. I am not looking for those who are reading the

manuscript simply to determine how to criticize or undermine its position. If you have noticed, for example, most atheists read the Bible almost exclusively for the purpose of determining ways to condemn and discredit it—they have little interest in actually understanding its content. Why would I routinely choose reviewers who would approach manuscripts in this same manner?

Peer review is certainly not perfect and is hardly unbiased. Again, I think you create an incorrect parameter. Humans are always biased. We often use two or three reviewers for a manuscript, which helps balance the bias of any particular reviewer. But anytime humans are involved, there will be bias.

In addition, your medical journals, as virtually any journal, have published articles that were refuted (at least partially) by further research. This does not disprove the value of peer review, *per se*. This is the nature of science and the limitations of human knowledge. As we learn, we realize that some of our ideas were wrong. Also, sometimes articles are published that probably should never have been published (*CRSQ* has its share too). Again, that is the nature of science publication and a failure of human endeavors. In fact, a huge criticism I would have of both RTB and ASA is they are far too impressed with the transient, temporal knowledge of humans, even to the point that Scripture must bow to “science” authority. I would challenge that a pure, straightforward reading of the Bible tells us that the days in Genesis were solar, 24-hour days, God

specially created each “kind” (they did not evolve from other life-forms), and that God flooded the entire world (a major geological cataclysm). Yet because of human opinion, many claim to accept the Bible but reject these tenets. When that human opinion changes (as it often does), they now must make the Bible change too. As you acknowledge with your medical journals, wrong ideas get published, even broadly accepted. Popular ideas fall out of favor and are replaced by new, popular ideas (and around and around we go). Why would I be anxious to subject the clear intent of the Bible to such fragile human thinking? If I accept Scripture as God’s Word, then it must be the definer of my science, not vice versa.

Also, you suggest that RTB and ASA do not claim to use peer review—suggesting that makes them more honest(?) than *CRSQ*. Whatever they may call it, I assure you, they do use some form of review process. In fact, over the years, young-earth creationists have submitted material to the ASA journal, and it has been routinely rejected by whatever review process they do use (peer review or not).

This brings me to your desire for more consensus building. Some of the original founders of CRS left ASA because they found that their views and positions were no longer very welcomed. Some members of CRS are still members of ASA (in an attempt to develop some type of consensus? or at least keep some YEC voice in ASA?). I guess the fruits of these attempts, so far, are a matter of opinion. Also, some theistic evolu-

tionists and non-young-earth creationists (including at least one from RTB) have actively contributed to the decidedly anti-God website, TalkOrigins.org. This makes any consensus building much more difficult. We do enjoy a very good relationship with the Discovery Institute, but we do not work closely with them on any specific activities as we each have different goals and directions.

As for CRS, our primary goal and stated purpose is to conduct research to develop and support a biblical creation model (including 7-day creation week and worldwide flood). Those who reject this model, whether they are evolutionists or progressive creationists, would not provide very constructive reviews of our models or our manuscripts. This does not mean their opinion may not have its place. Criticism always helps keep scientists’ ideas more focused and motivates them to further analyze and evaluate their own thinking. Also, as I mentioned, we do occasionally use “critics” for reviewers, but it has its place and it is not a routine or standard procedure.

As for the types of forums you mention, I have tried to get non-young-earth proponents to participate in the Editor’s Forum in *CRSQ*, but they have all, so far, declined. Occasionally, critics of CRS ask if I would allow them to submit a letter to *CRSQ*, but then they never actually submit one.

Hopefully this helps answer some of your questions and concerns.

Kevin Anderson, Ph.D.
Editor
Creation Research
Society Quarterly

Different Viewpoints

Editor,

Why do I have to agree with the Statement of Belief to become a full member? I've never heard of a scientific journal that has such a requirement. I can't find any evidence of discourse or argument in the journal articles I read, either—only sarcasm and derision for a “mindset” that is different than yours.

Please help me understand.

Emily Pollard

Editor's Response:

Emily,

Thank you for your inquiry. I am not certain how much I will be able to “help you understand,” since it is likely that we have totally different viewpoints on science and God's creation. But I will attempt to give a perspective.

First, your initial statement seems to reveal a bit of confusion. The Creation Research Society (CRS) is a membership society, not simply a journal subscription. I too am not aware of any journal (including the *Creation Research Society Quarterly*) that requires agreement with a “Statement of Belief” in order to subscribe to and receive the journal. Anyone can purchase a subscription to the Society's *Quarterly* (as do some evolutionists). There is a distinct difference between subscription to a journal and membership in a specialized society.

CRS is an organization of scientifically-trained people who have concluded that the biblical account of creation is an accurate historical record and also that contemporary scientific informa-

tion supports this account. Many of the original founders of CRS were initially members of the American Scientific Affiliation, an organization of scientists who also are Christians. However, by the mid-twentieth century, this organization was largely dominated by theistic evolutionists. Since this did not represent the scientific or biblical position of these specific individuals, they sought to form an organization that did represent their position and to invite other like-minded, scientifically trained people to join them. Thus, the origin of CRS. In order to prevent a similar “takeover” of CRS, as had occurred with the ASA, it was necessary to establish a “Statement of Faith.”

As a Society, our goal is to conduct research that will help develop and support a creation model of origins. CRS does not pretend (or ever suggest) that it represents all scientifically trained people, or even all those claiming to be creationists. It has a very specific purpose and a selective membership (certainly not the first or only organization or society with such parameters). Those who do not agree with our Statement are free “not to join,” but they can still have access to all of our publications.

Also, while other scientific organizations (such as the American Association for the Advancement of Science and the National Academy of Science) may not have a specific “Statement of Belief,” their websites contain (or at least have contained) specific anti-creation/anti-ID articles and declarations. So, they clearly have a position that governs the content of both their websites and journals (*Science* and *PNAS*, respectively). As such, it works the same as a “Statement of Belief,” but because evolution is the current popular belief, they have

little concern about creationists “taking over.” Thus, it is not necessary for them to be selective in membership (although known creationists are rarely selected to join the NAS).

As for our publications, I am not exactly certain what kind of articles you suggest that we publish. Most of the articles published in our *Quarterly* present research results or literature reviews. Typically, articles in any science journal are not going to be a discourse of opposing opinions. Our Letters to the Editor section sometimes contains exchanges of disagreement, providing readers a different perspective than the original article. On occasion an evolutionist has contacted me, challenging that we never publish letters from evolutionists. My response is always that I would gladly publish a letter if they want to submit one. They never do. We also have an Editor's Forum, which is an opportunity for discourse between two opposing views. So far, these forums have always presented opposing creation positions. From time to time I have invited evolutionists to participate in this forum, but they have always declined. (How often is the journal *Evolution* inviting contributions from creationists?)

I am not aware of any of our research articles containing much in the way of sarcasm and derision, let alone “only” sarcasm and derision. So that claim seems a bit of an exaggeration. I have to assume your reference to sarcasm and derision for a “mindset” is drawn mostly from my latest editorial. As an editorial, it offers an opinion—as do all editorials. Sarcasm is not uncommon in editorials. But these occasional editorials are only a small part of the overall content of the journal, hardly constituting “only sarcasm and derision.” If you have a spe-

cific criticism or refutation, then please do provide it. But overly-generalized accusations really serve little constructive purpose.

As a counterpoint, I do not have to look too far in either journals or society websites to find sarcasm and derision for viewpoints that do not agree with evolutionary naturalism.

Kevin Anderson, Ph.D.
Editor
Creation Research
Society Quarterly

Follow-up Reply:

Dear Kevin,

First of all, thank you so much for giving me a metered, polite response. I received another email as response to my inquiry, and it was also kindly and well reasoned. It seems that I need to think carefully about the tone and approach

of my initial e-mail an e-mail that was not nearly as well thought out as yours is here and reflect on where I was coming from when I wrote it.

It is likely that you and I do, indeed, have very different perspectives on the way the world came to be. However, that doesn't mean that I can't appreciate your Society's desire to approach the world from a view that is different from the mainstream, given that your belief system teaches something that is so contrary to that mainstream. Let me tell you that since sitting for a while, reading the articles that were available on your website without a subscription, my thinking has shifted slightly. I'm now a bit more acutely aware of how the literature might sound to a person who doesn't "believe" in Darwinian evolution. Just like, to me, the articles in your journal sounded ... not like something I believe to be true or even plausible, so must some of the articles in *Science* sound to a creationist.

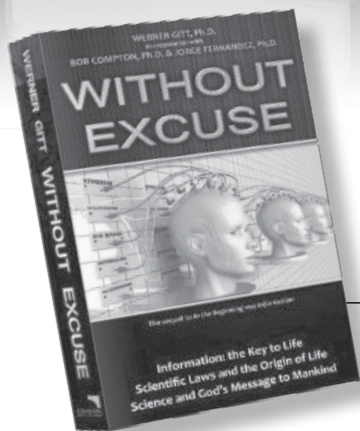
It saddens me deeply that I cannot name one single person in my social

sphere that's ever had a constructive conversation with a person who believes in creationism. Your words are the first I read that have deftly (and respectfully) explained to me the dynamics within the creationist community around science. Thank you for giving me fact rather than rancor. I had a terrible conversation a while back after I expressed my view that there is no God—I was attacked with biblical quotations and sloppy thinking, and it feels very good to read words that seem to have been written thoughtfully. I hope you will accept my apology for speaking hyperbolically about the sarcasm I sensed in the articles that I read. I believe that I have not yet gotten to a point where I can drop my defensiveness about a belief system that's so different than mine.

Anyway, thanks again for the reasoned response. I wish the worlds of my belief and those of yours weren't so far away.

Thanks,
EKP

Media Reviews



Without Excuse

by Werner Gitt,
Bob Compton,
and Jorge Fernandez

Creation Book Publishers
(Creation Ministries
International, Queensland,
Australia), 2011. 352 pages,
\$15.00.

“For [God’s] invisible attributes, namely, his eternal power and divine nature, have been clearly perceived, ever since the creation of the world, in the things that have been made. So [men] are without excuse” (Romans 1:20 ESV). Perhaps more than any other verse in Scripture, this has formed the backdrop for Creation Science apologetics. Information theorists in particular have focused on the reality that the design and information contained in the universe must necessarily give testament to an all-powerful Creator, forming an integral and vital part of Christian apologetics.

Yet few have explored the foundational questions this raises. What *is* information? Is it material or nonmaterial? What implications does information have on the assumptions of materialism? Is there any scientifically valid evidence that information leads us to the God of the Bible? It is precisely these questions that the authors intend to answer in this book.

Few people are as qualified as author Gitt to lay this foundation. With an impressive repertoire of awards and published works, he has long been recognized as an expert in information theory. While proponents of materi-

alistic evolution may not like the conclusions reached, the work cannot be dismissed. *Without Excuse* relies upon undisputed laws of science and logic, drawing from a wide range of mainline, peer-reviewed scientific publications in formulating the premises of the book, as well as in representing the claims of scientific materialism.

While this work is significant to experts, it is also important for Christians desiring to better understand the claims of materialistic evolution and to be capable of following the biblical command to tear down strongholds and “every lofty thing raised up against the knowledge of God” (2 Corinthians 10:4–5 NASB). Relevant to both the information theorist and the lay reader, *Without Excuse* contains essential information for understanding and engaging the culture.

Premised on the truth of Romans 1:20, the authors decisively confront the issue of defining information and its properties and proceed to formulate a scientifically valid series of deductions demonstrating how the existence of information leads one first to the existence of a deity and then specifically to the God of the Bible. A critical component of the book is in the introduction, where the authors bring the debate into the realm where it properly belongs: religion. The authors note that

this “ancient war” between creationists and evolutionists is ultimately one of competing worldviews, wisely refusing to give ground where it matters the most. By defining the conflict, they thereby establish a critical framework for the remainder of the book.

Chapter 1 focuses on the immense level of detail and organized complexity in the physical world. Gitt’s presentation of a variety of natural marvels must capture the imagination and engage a sense of wonder in readers of all ages and backgrounds, providing a springboard for the next seven chapters.

Chapters 2 through 5 delve deeply into fundamental questions of information theory. Gitt begins by exploring the definition and characteristics of information and explaining why previous theories fall short. He proposes three necessary conditions for, and five levels of, information, followed by 23 empirical statements that define the characteristics and effects of “universal Information.” Throughout, Gitt discusses the necessary effect the existence of information has on one’s perception of reality, as well as the impact it has on both materialism and a Christian apologetic. While chapter 2 does signal a shift into technical work, the material is made accessible through the use of graphics, diagrams and real-life examples of the concepts.

Chapters 4 through 5 lay the final pieces of groundwork through a discussion of the characteristics and limitations of science and then apply these principles to information theory to formulate laws of science that govern the realm of universal information. The importance of understanding this foundation cannot be overstated. Indeed, the common misunderstanding of science is arguably the center of the controversy, and until Christians gain a proper understanding it will be difficult, if not impossible, to make significant progress. The authors' continued emphasis on the foundational issues at play makes *Without Excuse* unique in its approach, as well as vitally important for readers in all walks of life.

Chapter 8 begins the application of information theory to a Christian apologetic. The authors demonstrate eight far-reaching deductions that universal information requires, including the existence and characteristics

of an intelligent sender, leading to the conclusion that there must be a deity as the creator of life. Each truth statement is supported by the laws of science and logic and arrived at by careful deductive reasoning, making the case for a creator with academic precision.

Gitt's work culminates in chapter 9, where he demonstrates that this Creator must be the God of the Bible. He provides a compelling argument that God is, and must be, the source of life, making the claims of Scripture true for all humanity.

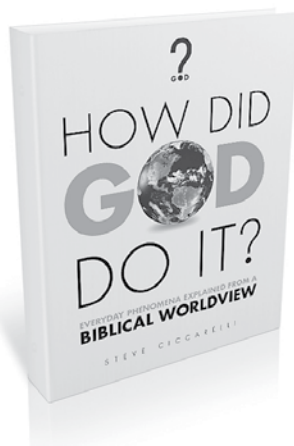
Taken as a whole, the most appreciated and essential feature of *Without Excuse* is the interweaving of solid academic material with worldview analysis, providing a work that addresses the foundational aspects of the culture war and vital tools for engaging it.

The layout of the book is technical in nature, and some readers may have difficulty adjusting to the style, but they

will ultimately find this format helpful in navigating the material and grasping key concepts. Some readers may also find it helpful to read the introduction and chapter 1 and chapters 6 through 9 first to gain a better framework for the relevance and direction of the heavier concepts in chapters 2 through 5. On the other side of the spectrum, readers desiring more in-depth discussions will find the appendices helpful and engaging.

Without Excuse is an excellent tool for every Christian, providing insight into the clash of worldviews and tools for defending the claims of Scripture. Moreover, it is highly recommended for any individual willing to genuinely investigate the claims of Christianity. They truly will find themselves "*without excuse*."

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How Did God Do It?

by Steve Ciccarelli

www.myphysicsfun.com, 2012,
264 pages, \$25.00.

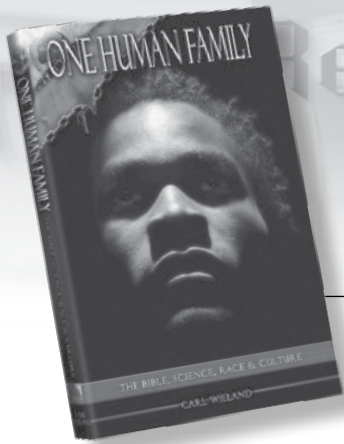
Author Steve Ciccarelli is an electrical engineer and administrator in a Fortune 500 semiconductor corporation. One expertise is the development of wireless receivers. In this book Steve reviews

several classical physics topics with creation worldview applications. Topics explained and illustrated with color figures include energy, light, motion, relativity, and sound. Especially well done are the optical concepts of Mie scattering (p. 64), polarization, and radar.

There is a large range of mathematics expectations in the book: Simple algebra is explained in detail early on, and

Maxwell's electromagnetic differential equations are included later. Math details are provided for Euler's Identity, the Normal Curve, and Fibonacci numbers. The book is helpful to readers who enjoy a clear description of physical science concepts. No subject index is provided.

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One Human Family: The Bible, Science, Race and Culture

by Carl Wieland

Creation Book Publishers,
Atlanta, 2011, 379 pages,
\$20.00.

This full color, well-illustrated, oversized book contains a wealth of information on the problem of racism and evolution in society, both today and in the past. Carl Wieland covers the anthropology, history, biology, and theology of racism. He documents that for Christians, the Bible condemns racism in all forms because, among other reasons, we are all descendents of Adam and Eve. Thus we are all brothers and commanded to love our neighbors as ourselves.

If this simple teaching were accepted by all Christians, the horrible history of racism documented in this work would never have occurred. Wieland documents that many Christians are cultural Christians only and due to Darwinism and other factors have for centuries rejected this central teaching of their faith. Christians are all too often influenced by their culture and negate the basic teachings of their putative faith (p. 38).

Wieland, quoting from scholarly academic sources as well as from Darwin himself, carefully documents the major adverse influence of Darwinism on the race problem. Wieland also shows that historically many progressive Christians who accept Darwinism also tend to accept racism, whereas staunch evangelicals reject both (pp. 54–55, 60).

One useful book section considers the problem of racism and evolution before Darwin. Wieland documents that

the race problem based on biology and evolution did not begin with Darwin, although it increased by an order of magnitude after Darwin published his 1859 work *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* (p. 51). The marine exploration by European peoples brought awareness of humans who were very different from themselves both in culture and physical appearance, especially Africans (p. 33). Theories of evolution were in the air before Darwin as well, such as the “fully fledged theory of evolution” penned by Darwin’s grandfather, Erasmus Darwin, as published in his book *Zoonomia* (p. 34).

Wieland also documents that early Darwinists such as Ernst Haeckel rejected the Bible teaching that all humans descended from Adam. Instead, Haeckel taught that Negroes and Caucasians were very distinct species (p. 47). This set the stage for not only racism but also Nazism.

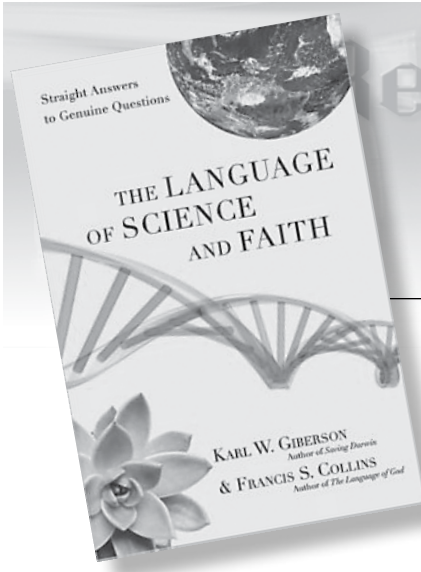
This book also covers the influence of Darwinism on eugenics, including Planned Parenthood and their early “Negro Project” designed to reduce “inferior races” (p. 64). Wieland’s well-documented discussion of the connection between Darwin and Hitler includes a section on his mother’s experience living in Nazi Germany (p. 69). She confirms the influence of evolution on Nazi race policy and how convincing it was to most Germans, including well-educated professionals.

Dr. Wieland also documents that race is not biological but rather primarily a social concept. All humans are genetically closely related, with only minor superficial differences such as skin, eye, and hair color (p. 73). Furthermore, skin and hair color are simply different shades of brown (p. 82). Blue eyes are not blue due to a blue-colored pigment but only appear blue because of how the iris of the eye reflects light. The same phenomenon causes the sky to appear blue.

Dr. Wieland quotes leading geneticists who confirm scientifically that the difference of coding genes between humans is only about 0.2 percent and is reduced further by intermarriage, confirming the biblical teaching of Adam and Eve as the parents of all humanity (pp. 74–75). There is greater variation within a particular ethnic group than between ethnic groups. In short, the book is very readable, informative, well written, and well documented.

The book includes numerous subsections of interesting historical events and biological facts called “features” that help to make the book entertaining and enlightening. This would be an excellent textbook for Christian schools, Sunday school classes, and leisure reading. It sets a new standard in quality in printing and scholarly content, an example of the progress creationists have made in recent years.

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The Language of Science and Faith

by Karl Giberson and Francis S. Collins

InterVarsity Press, Downers Grove, IL, 2011, 250 pages, \$20.00.

The authors are Eastern Nazarene College physics professor Karl Giberson and Francis Collins, director of The National Institutes of Health. They attempt to add a thin veneer of Christianity onto a thick tree of evolutionary naturalism. The “Grand Narrative of Creation” (pp. 215–221) outlines their position on biological origins, a fully orthodox, evolutionary view that attempts to explain all that exists in the living world purely by naturalistic means. That is, once life evolved from nonliving chemicals, it somehow continued to evolve as a result of natural selection, giving the results of mutationally damaged DNA. Most of the writing was done by Giberson, so I will use his name alone as the author.

The core of Giberson’s book is Darwinism sprinkled with an attractive garnish of theism and a few Scriptures from Genesis to add theism onto his otherwise atheistic account of Creation. Giberson may call his view theistic evolution, but Marvin Olasky concluded that Giberson’s theism was far “more deistic than theistic” (2011, p. 38) and, at least for the living world, is actually more atheistic than deistic. At the least, Giberson’s view differs in no practical way from atheism.

Giberson openly admits that for a Christian belief “that God created the

world ... is one of the most central beliefs ... second only to our belief in the ... importance of his [Jesus’] life, teaching, death and resurrection” (p. 15). Yet he expends 250 pages arguing that naturalistic evolution created it all, at least all of life from the simplest bacteria to the highest creation, humans. Only four pages later Giberson explains that he accepts evolution because science is a reliable way to understand the world. We believe science is an enterprise with great integrity, and that scientists are, in general, honest and objective in their work, and trustworthy in their conclusions. In embracing science we accept that the biological theory known as evolution is a reliable explanation for the development of the diversity of life on our planet (p. 19).

In other words, Giberson accepts evolution on the basis of its alleged authority, and not on the basis of documented experimental evidence or scientific research. He then dogmatically asserts, “There has been no scientific discovery since Darwinism—not one—which has suggested that evolution is not the best explanation for the origin of species” (pp. 21–22). This *Quarterly* makes clear that evolution is not the best explanation for the origin of species, but Giberson evidently has not read any of the half century of published research.

Giberson provides very little evidence of even having read the writings of any of those persons he so confidently critiques, including all stripes of Darwin doubters, especially creationists, but also

intelligent design supporters. He does quote William Dembski several times and lists works by Michael Behe and William Dembski in the references, but except for Henry Morris and Ken Ham, works by creationists are conspicuously absent. Not a single living PhD creation research scientist is quoted. Admittedly, Giberson does include an unbiased list of readings in the annotated biography (pp. 222–226), which includes both creation and intelligent design works. He is thus aware of the works that document the enormous evidence against naturalistic evolution, yet he ignores that evidence as if it does not exist.

One cannot properly respond to authors one has not read or understand their arguments. Anyone knowledgeable about the creationist position will be dumbfounded at the long, uninformed discussions Giberson includes in his book. He resurrects old arguments against the Genesis account of Creation that have been fully dealt with by creationists long ago (such as where Cain got his wife).

Giberson relies heavily on the writings of atheists and deists-lite, plus some fellow evolutionists who tack theism onto their writings to give it a Christian appearance. Giberson even claims that he is “unfamiliar with any premier scientists who reject evolution” (p. 31). But if he would have read the literature of those he wrote his book against, he would be aware of thousands of scientists who reject evolution, including many of the founders of his academic specialty, physics. It is true that this is

less true of today's generation than that of the last century, but science is not determined by consensus but rather by the evidence.

In contrast, Giberson's discussion of the evidence for the intelligent design of the universe is fairly well done. He believes in intelligent design of the universe, just not of life. This position will not win him support from any leading evolutionary scientists. Why he is so openly hostile toward those who accept intelligent design of life is difficult to understand. His uninformed conclusions will not do much to help his students at Eastern Nazarene College who struggle with their faith. It is no wonder that many people who attend Christian colleges leave the faith, as carefully documented by Ham and Hall in their study of Christian colleges (2011).

Giberson claims that "almost all Christian biologists accept evolution" (p. 30), yet a study of Christian colleges found that 51% of the leaders of the science departments are young-earth creationists, and 71% believe their science department professors teach young-earth creationism, and only 6%

of the Christian science departments teach evolution to be true (Ham, 2011, p. 20).

Giberson also covers the origin of life, optimistically concluding that naturalists are making good progress on an explanation for the abiotic generation of life from simple molecules (chemical evolution), discouraging what he calls the "simple response" of concluding that "God must have intervened to bring life into being" (p. 174).

Although Giberson is strong on claims, he is very weak on evidence. One of the few examples given is the GULO gene, which he claims is damaged in humans and many primates but not many other animals, indicating humans inherited a damaged copy from their common ancestor. As a result of this putative damage, we cannot manufacture vitamin C. This is at best a weak argument, and many explanations have been given for this fact, not the least is that the damage—if that is the correct explanation—was similar in humans and certain other primates due to mutational hot-spots (Wells, 2011). Giberson uses

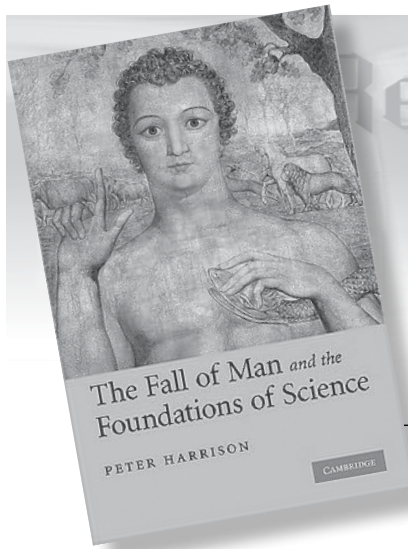
other examples of what he calls the poor design of the human body, all of which have been amply refuted.

Finally, the mistakes in this book, including those noted here, give evidence that it was not peer reviewed carefully. In one case Giberson calls Gregor Mendel a Belgian monk (p. 21), a mistake that could have occurred because Giberson is not a biologist but a physicist.

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- Olasky, M. 2011. Books of the year: two new books are important responses to the rapidly growing promotion of theistic—or, more properly, deistic—evolution. *World*, July, 22, pp. 37–41.
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The Fall of Man and the Foundations of Science

by Peter Harrison

Cambridge University Press,
New York, 2007, 258 pages,
\$48.00.

In the mind of the common man, science has warred with religion through time—ignorant faith against tested fact—with science finally overcoming (if not totally slaying) the horrible beast of religious oppression in the Enlightenment. While we look back on the “war stories” of the ancient kingdoms with disdain for their twisting of the facts to aggrandize king and kingdom, we rarely see our own similar foibles in our continuing misrepresentation of the long-running “war” between science and religion. While a number of books have taken on the false historical narrative, and some have taken on the necessity of faith to the actual practice of science, few have taken one specific point within the Christian worldview and drawn out the implications for the rise of science. This is the task Peter Harrison undertakes in *The Fall of Man and the Foundations of Science*. Specifically, Harrison argues that a rather specific view of the fall of man undergirds the idea of scientific experiment.

The author begins his work with an overview of the Christian view of Adam, beginning with the early Church Fathers and moving through time until he reaches the eve of the Enlightenment. This provides the reader with background for the next chapter, which explains how these views of Adam relate to the Augustinian view of the fall of man as de-

scribed in Genesis 3. Why is the contrast between man before the Fall and man after the Fall so important? Because the Christian view of the noetic effects of the Fall are crucial in understanding the reasoning used to lay the foundations of experimental science.

If our worldview indicates that the fall from grace in the Garden has impacted every possible point of human life, including our intellect, so that epistemology can only be grounded on the Scriptures, then there is little hope for humans (at least in their unsaved, unregenerate form) to gain any meaningful understanding of the world around them. If, however, it is possible to somehow reverse the effects of the Fall, or if the Fall left at least some human capacity for reason intact, then there should be some way for man to learn about nature. It is these two understandings that undergird the birth of the idea of gaining knowledge through experiment and observation. These two lines of thinking sometimes overlapped, of course, but they can be traced as separate strains through the history of science.

The reformers’ focus on human depravity, originally articulated in the context of a particular view of justification, was also to set the agenda for the epistemological debates of the following two centuries. In general, those influenced by the anthropology of Luther and Calvin were to adopt the position of mitigated skepticism characteristic

of empiricism and the experimental philosophy. Those who took a more positive view of human nature were more inclined to assert the reliability of human reason, the possibility of a priori knowledge, and the perfectibility of the sciences. (p. 7)

On the one hand, then, we find those who believed the effects of the curse could (indeed sometimes must) be reversed based on their view of the mission and role of the church at large. Covenant theologians argued that if the church was to take on its proper role of converting the world to Christianity before the return of Christ, to build the kingdom of Christ in the political and ecclesiastical structures of human government, then determining how to overcome the effects of the Fall on the human mind was necessary. On the other hand, we find those who believe that the Fall didn’t leave man shorn of reason. What is necessary, in this view, was the use of tools to increase the power and reach of man’s mind in order to find what Adam knew but the human race had lost.

Harrison shows these two threads came together through a pragmatic technique, the simple idea of experimental science. While neither side really agreed on the purpose they were trying to achieve, both could agree on, and wholeheartedly support, the means to reach their own ends: the idea of repeatable experiments based on the reliance on the powers of human observation.

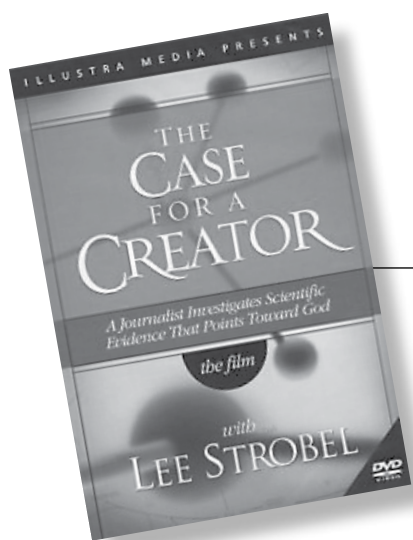
Hence the idea of the scientific experiment flows from two very specific and intertwined views of the nature of the Fall, the nature of fallen man, and the relationship between these ideas and practical epistemology.

The author provides a strong and compelling argument for his primary thesis, carrying the day with a wide array of references to primary and secondary sources. There are weaknesses in *The Fall of Man*, however. The first of these is that the author clearly falls into the camp of modern critical theory, treating

the Scriptures as interesting and important but not without error. For instance, the Fall is treated as a “myth,” however foundational it might be to Christian theology, and those who retreat to the Scriptures as a primary foundation for attaining knowledge are not always taken seriously. Harrison sometimes misreads the theological import of certain movements as well. For example, he misconstrues the meaning of chiliasm, stating it was bound up in the idea of setting up the conditions necessary for the return of Christ.

For those who are interested in the intertwining of scientific and religious thought, specifically their overlap at the intersection of worldview, this is an important and interesting study. This is particularly so because of its focus on one specific area and the clear ties the author draws within this one realm. That the Fall of man should be so closely tied to the development of the experimental method within Science is a provocative and interesting result.

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The Case for a Creator DVD

Chris Bueno and
Larry Frenzel, Directors

Illustra Media, La Mirada, CA,
2006, 60 minutes, \$20.00.

Illustra Media produces DVDs on the topic of intelligent design alongside the Discovery Institute. Its products include *Unlocking the Mystery of Life* (2002), *The Privileged Planet* (2004), and *Darwin's Dilemma* (2009). All are of high quality with excellent graphics, expert interviews, and historical footage.

The Case for a Creator DVD parallels Lee Strobel's 2005 book of the same title. Journalist Strobel worked 14 years as the legal editor for the *Chicago Tribune* and other newspapers. A non-believer, Lee was inspired by his godly wife to explore biblical Christianity. The

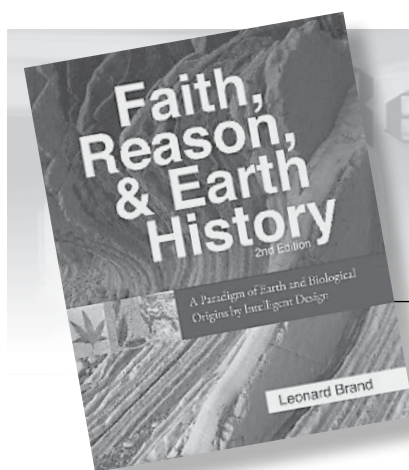
closer he looked, the more convinced Lee became that his lifelong evolutionary assumptions were without a valid basis. Especially revealing was the failure of the 1953 Stanley Miller experiment and all subsequent efforts to find convincing evidence for the spontaneous origin of life. Lee's resulting Christian worldview has led to many apologetics books, including the series *The Case for... Christ* (1998), *Faith* (2000), *Easter* (2004), *Christmas* (2005), and *the Real Jesus* (2007).

A portion of this DVD is narrated by Lee Strobel himself. Other speakers include several of the Discovery Institute team, including Stephen Meyer and Michael Behe. CRS *Quarterly* readers know that Lee Strobel and the intelligent design movement play down emphasis on the personal Creator—note the small *a* in the title of this DVD and book. The

ID movement also accepts deep geologic time and tends toward theistic evolution. This DVD does not dwell on these issues but limits itself to excellent discussion of the Cambrian Explosion, fine-tuning of physical constants, and complexity of cells. One interesting DVD segment pictures a host of chimps at computer keyboards, illustrating the impossibility of their typing one of Shakespeare's plays.

Illustra's DVDs require some supplementing with the tenants of recent creation, including supernatural creation, young earth age, and the global Flood. That said, the DVDs, including the *Case for a Creator*, are of great value in challenging naturalism.

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Faith, Reason, & Earth History

by Leonard Brand

Andrews University Press,
Berrien Springs, MI, 2009,
508 pages, \$65.00.

Author Leonard Brand chairs the Department of Earth and Biological Sciences at Loma Linda University, California, one of the flagship schools of the Seventh-Day Adventist Church. Leonard Brand holds a Ph.D. from Cornell University in ecology and evolutionary biology. He has researched diverse fields, including tree-climbing chipmunks, fossil whales in Peru, and vertebrate fossil tracks in Arizona's Grand Canyon.

Dr. Brand is a young-earth creationist and has collaborated on research projects with Kurt Wise and Steve Austin. In the book preface he thanks manuscript reviewers, including philosopher Del Ratsch and intelligent design pioneer Phillip Johnson. Dr. Brand believes that "God has intervened throughout history and is still intervening" (p. x). He prefers the term "informed intervention" because of the negative connotations often connected with the terms "creationist" and "creationism" by the scientific community.

Dr. Brand is known as a peacemaker who promotes a courteous approach to the creation-evolution controversy. He takes seriously the latter phrase of 1 Peter 3:15, where Christians are cautioned to defend their faith with gentleness and respect (meekness and fear, KJV). One goal of this book is to "reduce the destructive verbal attacks and sarcasm of Christians toward evolutionary scientists" (p. xii) because "ridicule is never constructive" (pp. 33, 247).

This book is the second edition of a popular 1997 volume. It gives a clear overview of the scientific method and its

limitations. Also briefly described is the history of science, including Thomas Kuhn's paradigm view of science progress over time. As one might expect, there is frequent mention of Adventist creation advocates, both past and present, including Robert H. Brown, Harold G. Coffin, George M. Price, and Ariel A. Roth. The book also includes many references to *Origins*, a Loma Linda journal publication since 1974.

Dr. Brand lists six biblical anchor points that identify his scientific worldview (p. 122): (1) A literal, supernatural creation week; (2) a fully functional mature creation from the beginning of time; (3) an original sinless creation with no death, followed by the Curse; (4) an earth history of just thousands of years rather than millions or billions; (5) a global Noachic Flood; and (6) the reality of all biblical miracles.

In the heart of this book, Dr. Brand compares micro and macro evolution, young- and old-earth views, and catastrophic-gradualist earth histories. In each case the best supporting evidence for the divergent views is provided. The creationist, young-earth worldview is shown to be a fully credible option. Remaining unanswered questions are clearly spelled out, and this is also done with the naturalistic theistic evolution alternatives.

One topic covered in considerable depth is Carbon-14 dating, where the RATE research project is referenced. Other topics discussed that challenge naturalistic science include the Cambrian Explosion (p. 272), the geologic column (p. 345), the Ice Age (p. 340), radioisotope isochrons (p. 365), junk DNA (p. 285), Hox genes (p. 282), plate tectonics (p. 415), the Spokane Flood (p. 352), spontaneous generation (p. 46), the Tiktaalik fossil (p. 242), and vestigial organs (p. 250). The book limits

itself to earth studies and does not discuss the big bang theory, space science, or the challenge of seeing distant starlight in a young universe.

Sociobiology typically applies evolutionary interpretations to the social behavior of animals and people with doubtful results. Author Brand turns this around and gives some interesting possibilities from a creationist perspective. For example, altruistic behavior is first presented along with many unconvincing attempts for an evolutionary basis. Dr. Brand then suggests that true altruistic behavior may have been much more common at the beginning of creation (p. 215). Animal altruism existing today is the remnant that has survived the negative effects of mutations, which cause the loss of original positive behavior patterns. Also, "Perhaps, originally, subadult animals commonly assisted their parents in raising the next brood or litter" (p. 215). Population control mechanisms may also have been in place originally, along with a stable ecological balance. The earth's geography and ecosystems today, while still amazingly diverse, give evidence "that the earth in its current changed state is the wreckage of a drowned planet – the remains of what was left after a geological catastrophe" (p. 394).

It would be a privilege to take a university course taught by author Brand wherein this book is used as the text. Other Brand publications are listed at <http://resweb.llu.edu/lbrand/articles.html>. The book has a host of clear figures presented in a pleasing, brown-red shade. Also included are a glossary, 500 references, and a detailed index. The book concludes with a clear gospel challenge.

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Instructions to Authors

Submission

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

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

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

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

Appearance

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

Submitted manuscripts should have the following organizational format:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

8. Figures. All figures cited in the text should be individually placed in numerical order, and placed after the tables. Do not embed figures in the text. Each figure should contain

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

Special Sections

Letters to the Editor:

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

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

Book Reviews:

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

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Creation Research Society

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

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

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

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

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

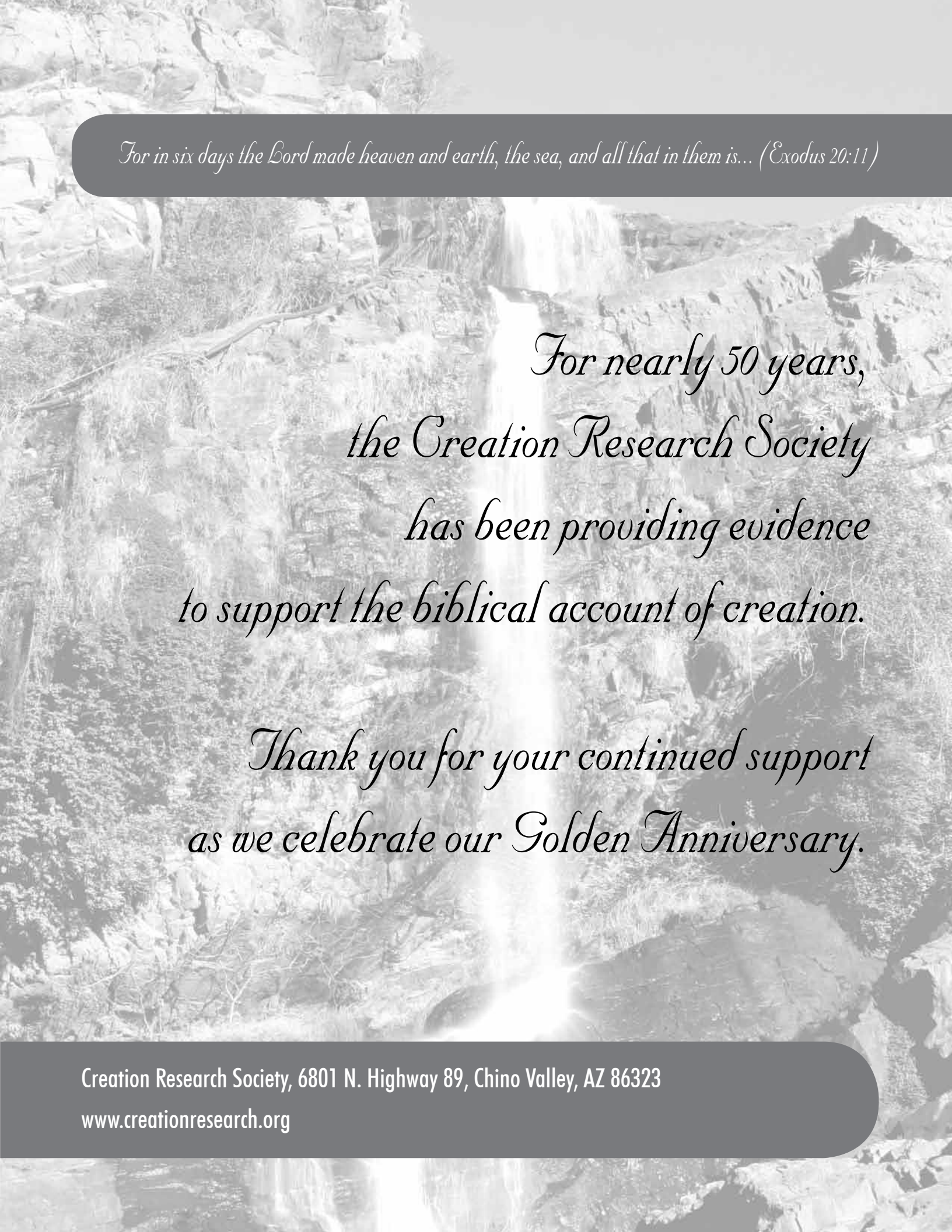
1. The Bible is the written Word of God, and because it

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

2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.

3. The Great Flood described in Genesis, commonly referred to as the Noachian Flood, was a historical event worldwide in its extent and effect.

4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Savior. The act of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation can come only through accepting Jesus Christ as our Savior.



For in six days the Lord made heaven and earth, the sea, and all that in them is... (Exodus 20:11)

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