EDITORIAL

HOW TO WRITE AN UNPUBLISHABLE PAPER

Origins addresses ideas at the center of a debate concerning substantial issues in both science and theology. Most of our authors and editors are scientists and are thus best equipped to evaluate the weight and structure of scientific arguments. Unfortunately, good scientific arguments are in short supply on both sides of the creation-versus-evolution debate. The purpose of *Origins* is to provide a forum for publication of those good scientific arguments that are made within the paradigm of creation.

Differentiating between good arguments and weak arguments requires a level of discrimination that is not always appreciated when poorly argued papers are rejected. What elements typify a poorly argued paper? Several characteristics are commonly present and difficult to hide behind elegant prose. These include:

1. Defining terms in such a way that a certain conclusion is inevitable — winning by definition.
2. Equivocating between definitions to advance an argument.
3. Ignoring opposing arguments while presenting patronizing non-explanations and question-begging answers.
4. Failing to clearly state presuppositions necessary to the logic of an argument.
5. Extrapolating excessively beyond the data.
6. Mischaracterization of individuals who make opposing arguments — the *ad hominem* fallacy.
7. Misstatement of opposing positions so that the misstated position is easy to knock down — the straw-man fallacy.
8. Supporting an argument with already discredited claims.

Not all poorly argued papers exhibit all of these traits, but almost all will involve one, and most frequently several, of the eight listed.

Self-serving definitions are generally easy to spot. For example, a Darwinist might define vestigial organs as Douglas Futuyma did: "**vestigial** — Occurring in a rudimentary condition, as a result of evolutionary reduction from a more elaborated, functional character state in an

ancestor."[1] Such a definition is not neutral or even useful when discussing the meaning of rudimentary organs. Rather, it forces by definition the conclusion that rudimentary structures found in one species result from common ancestry with other species employing the same structure in some more elaborate form. Depending on the circumstances, this may or may not be a reasonable and logical conclusion, but a definition like this automatically wins the evolution argument by forcing acquiescence to unstated presuppositions.

In general, arguments about vestigial organs represent a kind of question-begging approach to the larger question of the reality of Darwinism. Most who doubt Darwinism are not concerned about the uncontroversial claim that functions can be lost because of random mutations. The contentious claim of the neo-Darwinian synthesis is that random mutations coupled with selection can make functional organs in the first place. Thus, talking about vestigial organs in the context of evolution is a red-herring argument that ignores opposing arguments by providing a question-begging answer; and does so by equivocating between defining evolution in the neo-Darwinian mechanistic sense versus the related but different question of common ancestry. Further, this definition requires certain unstated presuppositions about the nature of life and reality of common ancestry.

But *Origins* exists to do more than simply expose incoherent Darwinian arguments. In fact, while an honest analysis of alternative positions is necessary, positive and well-constructed arguments discussing evidence of the Creator's hand in nature are of greater interest. However, this does not mean that fallacious creationist arguments are worthy of being printed. What might serve as examples of faulty creationist reasoning? Jumping from such structures as turbidites, which form quickly, to claiming that the entire geologic column formed rapidly and is thus easily accommodated with a short chronology illustrates excessive extrapolation. Yes, turbidites do allow accommodation of some of the data, but not all, or even a majority, of it.

Good science generally makes modest claims and does not over-extrapolate. In fact, extrapolating from turbidites to the entire geologic column requires not just overstating what the data say, but also ignoring opposing claims about such things as stromatolites in the column and the time they take to grow. Any scientific theory about formation of the geologic column must take into account all of what is known. This does not mean that everything that is thought to be true must be shoehorned into every

theory, but when there are major elements that do not fit, this needs to be, at a minimum, acknowledged. A good theory may have a domino effect in other areas and suggest reexamination of ideas that were thought to be true, but it cannot do this if tensions are glossed over.

Perhaps the most shameful attempts at misleading that commonly appear in discussions of the origin of life involve the *ad hominem* fallacy. Blackening the reputation and character of opponents in a debate does nothing to advance an argument logically; but it is an invaluable weapon employed in the art of sophistry, especially when presented before a friendly audience. Thus when Richard Dawkins, commenting on the PhDs of those who believe in creation, writes: "often they are earned not at real universities, but at little-known Bible colleges deep in Bush country."[2] He receives a big cheer from fellow secular humanists and reassures the faithful that they are the smart ones facing the most stupid of opponents. But logically it makes no difference whether it is only the unwashed masses who believe something. If it is true, it is true. If it is false, then that should be exposed on the basis of rational logic and empirical data. In any case, the very assertion Dawkins makes in this statement reveals his own prejudice and ignorance in a way that should make reasonable people wonder about his other claims.[3]

A fallacy related to the *ad hominem* fallacy is the straw-man fallacy in which the position one is opposed to is misstated in such a way that it can be dismissed easily. This is commonly done when the neo-Darwinian mechanism is equated with chance alone. While chance mutations do play a central role in neo-Darwinism, they do not act alone, but in concert with the "law" of natural selection. Substantial arguments against neo-Darwinism do not invoke chance alone or natural selection alone, but consider carefully the potential of these two components working together. When this is done, neo-Darwinism may still fail to account for what is observed in nature; careful thinking and good logic do not need to employ straw men to prevail.

One frustration all who are interested in open and honest dialogue face when discussing the relative merits of creation and Darwinian evolution is the realization that some false claims, no matter how discredited, never seem to die. Charles Darwin pointed out how destructive this is: "False facts are highly injurious to the progress of science, for they often endure long."[4] Examples of "false facts" that are still commonly raised include, "human" and dinosaur footprints in the Paluxy River of Texas and the deathbed conversion of Charles Darwin. On the Darwinian side, Ernst

Haeckel's long-discredited claim that the development of organisms replays their evolutionary history (ontogeny recapitulates phylogeny) is recycled with tiresome regularity.[5] Use of known falsehoods to win at all costs is an inexcusable tactic that exploits the ignorance of one's audience and leaves them more ignorant than they were before being misled.

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ENDNOTES

1. Futuyma DJ. 1998. *Evolutionary Biology*. 3rd edition. Sunderland, MA: Sinauer Associates. Glossary. This quote is cited with approval at: http://www.talkorigins.org/faqs/quotes/scadding.html.
2. Dawkins RC. Sadly an honest creationist. *Free Inquiry* 21(4). http://www.secularhumanism.org/library/fi/dawkins_21_4.html.
3. Dawkins makes this comment in reference to a publication: Ashton JF, editor. 1999. *In Six Days: Why Fifty Scientists Choose to Believe in Creation* (Sydney: New Holland Publishers. 360 pages). Of the 53 PhD degrees earned by the 50 authors, 47 came from state-run universities. The remaining 6 are Harvard, Columbia, Clark, Loma Linda (2) and Columbia Pacific (a diploma mill, but this author also has a real PhD from Wayne State University). Of the 28 PhDs from US Universities, only 7 came from states won by George W. Bush in the 2000 presidential election.
4. Darwin CD. 2004. *Descent of Man and Selection in Relation to Sex*. Chapter XXI: General Summary and Conclusion. NY: Barnes & Noble Books, p 550.
5. For example, see Quammen D. 2004. Was Darwin Wrong? (also entitled "Darwin's Big Idea" in the Contents). *National Geographic* (November), p 2-35. For an excellent discussion of Haeckel's embryos, see Chapter 5 in: Wells J. 2002. I*cons of Evolution: Science or Myth? Why Much of What We Teach about Evolution is Wrong.* Washington DC: Regnery Publishing. For a Darwinist perspective see: Gould SJ. 2000. Abscheulich! [Atrocious!]. *Natural History* 109(2):42-49.

ARTICLES

A NOTE ON THE PRE-FLOOD/FLOOD BOUNDARY IN THE GRAND CANYON

Kurt P. Wise* & Andrew A. Snelling**

ABSTRACT

The most extensive stromatolite horizon known in Grand Canyon sediments is found in the base of the Awatubi Member of the Kwagunt Formation of the Chuar Group. It is suggested that the greater functionality of growing, compared with fossil, stromatolites indicates they were formed by secondary process and not directly created by God. The top-heavy upright orientation of the stromatolites in the Awatubi bed suggests they were formed in situ, *which in turn suggests that they predate the Genesis Flood and postdate the Day Three Regression, contra earlier suggestions by the authors (Snelling 1991, Wise 1992). On the other hand, it is consistent with Austin & Wise's (1994) suggestion that the base of the Sixtymile Formation (overlying the Kwagunt Formation) represents the pre-Flood/Flood boundary in Grand Canyon and Austin's (1994) suggestion that the Chuar Group was formed in antediluvian times. Good preservation of organics and no preservation of higher organisms suggests that Wise's (2003) hydrothermal fringing reef model for sediments near Death Valley also applies to Grand Canyon's correlative Chuar Group sediments and contained Awatubi stromatolites. The Awatubi stromatolites thus formed an intertidal "forest" about hot springs in an intertidal region at the edge of the pre-Flood continent, hundreds of kilometers from land.*

INTRODUCTION

In previous publications, the authors (Wise 1992, Snelling 1991) have suggested conflicting interpretations of strata underlying the oldest animal fossils (pre-Ediacaran strata). Wise (1992) suggested an origin on Days Two and Three of the Creation Week, whereas Snelling (1991) suggested a Flood origin. Based upon an examination of the pre-Ediacaran sediments in the Grand Canyon, this paper is official notice of a change in both our positions (see Snelling [1991] and Wise [1992] for discussion).

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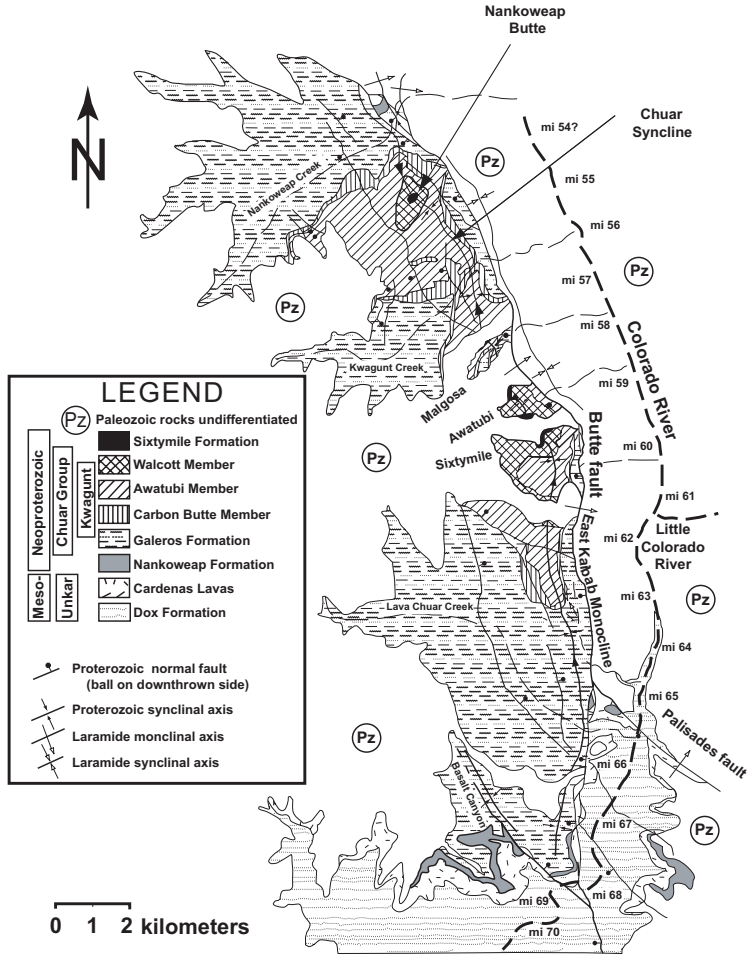

Figure 1. Geologic map of the Chuar Group in eastern Grand Canyon (modified from Timmons et al. 2001, Fig. 4).

PLACEMENT OF THE PRE-FLOOD/FLOOD BOUNDARY

Austin & Wise (1994) introduced a method of identifying the pre-Flood/Flood boundary at a given location. They maintained that according to Scripture the most substantial catastrophe punctuating earth history was Noah's Flood. Furthermore, the onset of the Flood, marked by the "breakup of all the fountains of the great deep...on the same day" (Genesis 7:11) would suggest that the events at the very beginning

of the Flood were even more catastrophic than subsequent events in the Flood. Based upon this, the pre-Flood/Flood boundary in any local stratigraphic column should correspond to the most significant geologic discontinuity in that column. Austin & Wise (1994) inferred from this that the coincidence of the most significant paleontological, erosional, time, sedimentary, and tectonic discontinuities in a given stratigraphic column should be a good candidate for the location of the pre-Flood/Flood boundary. Based upon these discontinuity criteria, Austin & Wise (1994) proposed the pre-Flood/Flood boundary in the Grand Canyon should correspond to the base of the Sixtymile Formation (top of the Kwagunt Formation) (see Figures 1 & 2). The following points are offered in support of this position:

1. **The most substantial Paleontological Discontinuity in the Grand Canyon is somewhere between the base and the top of the Sixtymile Formation** (Austin & Wise 1994). The Sixtymile Formation in the Grand Canyon (see Figure 2) is unfossiliferous. Undisputed multicellular fossils are found only above the Sixtymile Formation (e.g., numerous ichnofossils in the Tapeats Sandstone and abundant animal body fossils in the Bright Angel Shale above that: Ford 1990, Ford & Dehler 2003). Stromatolites are found both above and below the Sixtymile Formation (Ford & Breed 1969, 1973, 1974a,b; Ford 1990; Dehler et al. 2001; Timmons et al. 2001; Ford & Dehler 2003). Acritarchs (fossils of probable algae) are also found both above and below the Sixtymile Formation (Downie 1969, Ford & Breed 1969, Vidal & Ford 1985, Ford 1990, Karlstrom et al. 2000, Dehler et al. 2001, Timmons et al. 2001, Ford & Dehler 2003) (see Figure 2). Just below the Sixtymile Formation, the Kwagunt Formation contains fossils of cyanobacteria (Horodyski 1993) and testate amoebae (Bloeser 1985, Ford 1990, Horodyski 1993, Dehler et al. 2001, Porter et al. 2003, Ford & Dehler 2003). There is therefore a discontinuity in both paleontological abundance and complexity somewhere between the upper and lower bounds of the unfossiliferous Sixtymile Formation.

2. **The second and possibly third most substantial Erosional Discontinuities in the Grand Canyon are at the base and top of the Sixtymile Formation** (Austin & Wise 1994). The

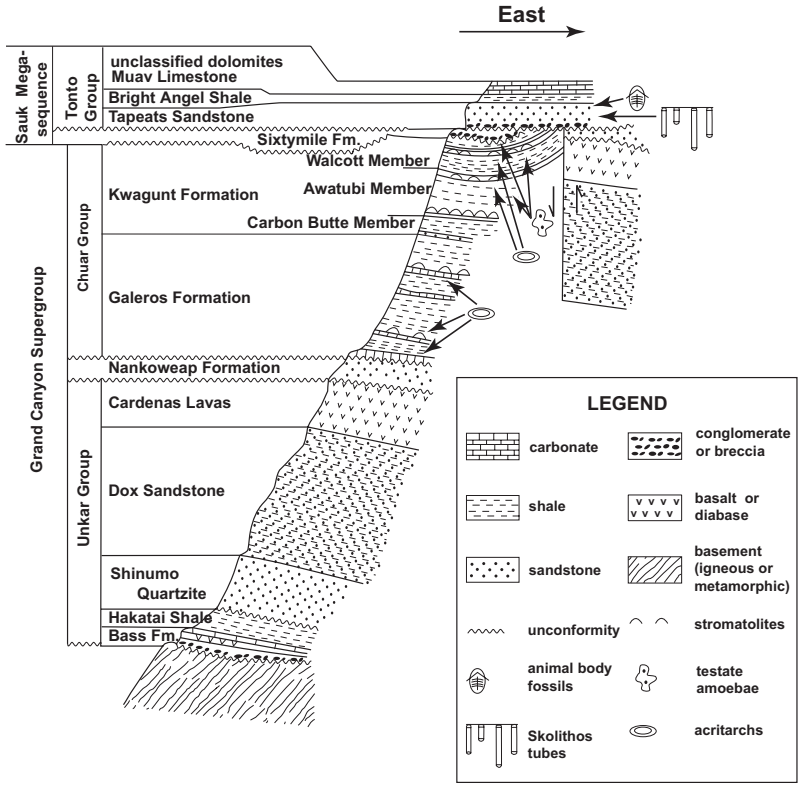

Figure 2. Stratigraphic outline of Cambrian and Precambrian sediments of eastern Grand Canyon. Thicknesses to scale (modified from Ford & Breed 1972, Fig. 1; Elston & McKee 1982, Fig. 2; Dehler et al. 2001, Fig. 2).

most substantial erosional unconformity evidenced in the Grand Canyon is at the "Greatest Unconformity" — the erosional surface that separates the crystalline rocks which have the appearance of having been formed at elevated temperatures and pressures, from the sediments of the Canyon formed at surface temperatures and pressures. Second to this erosional event would be the "Great Unconformity" at the top of the Sixtymile Formation, which cross-cuts every formation in the 4,145 m of sediment found beneath it in the Canyon. Possibly the third most extensive erosional event is found at the base of the Sixtymile Formation. Although only 2 m of erosion are directly evidenced by the

basal topography of the formation, megaclasts within the formation suggest extensive erosion may have been associated with Sixtymile deposition. Elston (1979) and Elston & McKee (1982) identified limestone megaclasts from a stratum at least 70 m down in the Kwagunt Formation (which Timmons et al. [2001] dispute), and at least one sandstone megaclast which may have come from the upper Nankoweap Formation, almost two stratigraphic kilometers below the Sixtymile Formation.

It is possible — even likely — that the exposure of these lower units occurred in the hanging wall of the nearby Butte Fault. If so, then the Sixtymile Formation megaclasts were generated by substantial mass-wasting-type erosion. Furthermore, the breccia and megaclast content of the Sixtymile Formation suggest both short-distance transport and rapid deposition — all of which could occur very rapidly. It could conceivably be true that the erosion at the base of the Sixtymile Formation is actually an early phase of the erosion at the top of the Sixtymile Formation — that which produced the Great Unconformity. This would suggest that the Sixtymile Formation is itself the result of the second largest erosional event evidenced in Grand Canyon strata. Therefore, the top and bottom of the Sixtymile Formation represent (respectively) the second and third (or possibly even second) largest erosional events in the stratigraphy of Grand Canyon.

3. **The most substantial Time Discontinuity in the Grand Canyon is at the base of the Sixtymile Formation** (Austin & Wise 1994). Because they could have been formed centuries before the Flood, many pre-Flood sediments would have been well lithified by the onset of the Flood. Thus early Flood erosion would be expected to have generated extensive conglomerates and breccias containing clasts of pre-Flood sediments. Flood-generated sediments, on the other hand, probably experienced only limited lithification in the course of a year-long Flood. It would be expected, then, that Flood erosion of Flood sediments would only rarely generate conglomerates of lithified sedimentary material. Plus, even though there would be time after the Flood to lithify sediments, the scale of erosion would be less

extensive after the Flood. Therefore, the onset of the Flood might be expected to have generated the most substantial conglomerate and breccia units of sedimentary clasts in the entire stratigraphic column. Included in the lower beds of the Sixtymile Formation are huge angular megaclasts derived from beds in the underlying Kwagunt (Elston 1979, Elston & McKee 1982). Given the angular nature of the clasts and the degree to which the Kwagunt sediments of those clasts stayed together with transport, the Kwagunt Formation sediments seem to have been at least somewhat lithified at the initiation of Sixtymile Formation sedimentation. This suggests that a time discontinuity existed between the deposition of upper Kwagunt Formation and the deposition of the lowermost Sixtymile Formation sediments.

Although the Sixtymile Formation is not the only conglomerate in the stratigraphic column of the Grand Canyon, it and the basal Tapeats contain by far the largest clasts (Elston [1979] reports a block 8 m by 40 m in size; Chadwick [personal communication] reports a Shinumo Quartzite clast in Clear Creek Canyon approximately 80 m in diameter). Therefore, the first and second most substantial time discontinuities evidenced in Grand Canyon strata are found at the top and base of the Sixtymile Formation.

4. **The most substantial Sedimentary Discontinuity in the Grand Canyon is at the base of the Sixtymile Formation** (Austin & Wise 1994). The large megaclasts of underlying Kwagunt Formation in the Sixtymile Formation are found beginning only 2 m above the base of the Formation. The megaclasts are piled up at least three deep and separated by meter-thick pebble to boulder breccia layers. Above the megaclasts is found 7-10 m of massive pebble to cobble breccia topped in turn by alternating beds of sandstone and pebble breccia (see also the description of the Sixtymile Formation type locality in Elston 1979). The entire Sixtymile Formation is a conglomerate. This is in substantial contrast to the 2-km thickness of Chuar Group sediments below the Sixtymile Formation (primarily fine clastics with occasional sandstone or carbonate beds). Furthermore, because it contains clasts comparable to those found in basal conglomerate of the overlying Tapeats (see above), the Sixty-

mile Formation could be included within the Tonto Group as the initial depositional unit in a fining-upward set of strata. From the base upwards are the Sixtymile Formation megabreccias, Tapeats Formation sandstones, and Bright Angel Formation shales, all capped with the Muav Formation and unclassified carbonates (see Figure 2). This could mean that the Sixtymile Formation is best understood as an early phase of the event which would later deposit Tapeats sediments.

Given the nature of the Sixtymile sediments (i.e., breccia, megaclasts) all the evidence we have is for a brief depositional period for the formation (perhaps a matter of minutes). This could easily be understood to be a very high energy mass wasting phase of a depositional regime which as the energy subsided, would generate Tapeats sediments. This in turn would mean that the unconformity *beneath* the Sixtymile Formation (and not the one above it) should be understood to be the unconformity bounding the base of the Tonto sequence in Grand Canyon. The biostratigraphic, lithologic, and structural correlations between the Tonto Group and a huge suite of formations up and down the west coast of North America (Stewart 1972, 1991) would suggest that the Sixtymile Formation and Tonto Group above it represent the Grand Canyon expression of an unconformity-bounded fining upward sedimentary sequence of continental scale (in North America called the Sauk Sequence). The base of the Sixtymile Formation thus represents a sedimentary discontinuity marking the beginning of a sedimentary sequence of the scale expected in a global Flood.

5. **The base of the Sixtymile Formation may represent the most significant tectonic discontinuity in the Grand Canyon** (Austin & Wise 1994). About 1.5 km east of the easternmost exposures of the Sixtymile Formation is the NNW-SSE trending Butte Fault (see Figure 1). West of the Butte Fault the Tapeats Sandstone sits atop the Sixtymile Formation. At about the same distance to the east of the fault, the Tapeats sits atop the Nankoweap Formation.[1] Given that approximately 2000 m of Chuar Group sediments lie between the Sixtymile and Nankoweap Formations, there was at least 2 km of vertical displacement

along the Butte Fault (as represented in Figure 2). Note also that this displacement must have occurred *before* the erosion event evidenced by the Great Unconformity and *before* the deposition of at least most of the sedimentary package known as the Sauk Sequence. This suggests that the Sixtymile Formation was not only associated with erosional, time, and sedimentary discontinuities, but that it was also associated with a large magnitude tectonic disturbance as well.

The syncline containing the Sixtymile Formation is adjacent and parallel to the Butte Fault (see Figure 1). It is also convex downward and makes up the down-dropped block. It is thus very possible that the syncline is actually a drag fold caused by pre-Tapeats motion on the Butte Fault. Elston (1979) and Elston & McKee (1982) observed that Sixtymile Formation beds thin on the limbs of the syncline as if the syncline was formed before and/or during the deposition of Sixtymile Formation sediments. Although on a smaller scale, the Chuar Group sediments have also been observed to thin in the same way (Timmons et al. 2001). This suggests that pre-Tapeats movement on the Butte Fault began with deposition of the Chuar Group and intensified with the deposition of the Sixtymile Formation.

In the type section of the Sixtymile Formation (where Tapeats Sandstone overlies it), the uppermost Sixtymile Formation sediments (in the core of the syncline) have the same orientation as the overlying Tapeats (Elston 1979, Elston & McKee 1982). As inferred by Elston (1979) and Elston & McKee (1982), this suggests movement along the fault may have been terminated by the time the uppermost Sixtymile Formation sediments were deposited.

Because several of the largest megaclasts have bedding nearly parallel with the containing Sixtymile Formation sediments, Elston (1979) and Elston & McKee (1982) argued that they were probably emplaced by sliding. Their angular nature would further suggest they were not transported very far, so Elston (1979) and Elston & McKee (1982) suggested they probably came from the Butte Fault. Lacking any evidence of time,[2] Elston (1979) and Elston & McKee (1982) thought the Sixtymile Formation

was deposited quickly. This suggests something on the order of 2 km of vertical movement occurred on the Butte Fault during the brief depositional period of the Sixtymile Formation. This in turn suggests the Sixtymile Formation corresponds to a very significant tectonic discontinuity (what Elston & McKee [1982] call "The Sixtymile Formation Disturbance"). By comparison, whereas the Great Unconformity above the Sixtymile Formation evidences a remarkable amount of erosion, its level surface over huge distances suggests relatively little tectonic deformation was occurring concurrent with that erosion.

The Sixtymile Formation Disturbance (Elston & McKee 1982) may well be a substantial tectonic disturbance that immediately preceded the great erosional event which resulted in the Great Unconformity. Elston (1979) and Elston & McKee (1982) even suggested that the Sixtymile Formation might be correlated with other early Sauk Sequence landslide deposits elsewhere in North America, such as the Windermere Group of Montana and Idaho. If so, a single tectonic disturbance may have generated large-scale avalanche deposits many hundreds of kilometers apart from one another. A tectonic disturbance of such a continent-wide magnitude would be consistent with the tectonic upheaval associated with the breaking up of all the fountains of the great deep at the very beginning of the Flood (as suggested by Austin et al. 1994).

If, however, the pre-Flood/Flood boundary is placed at the base of the Sixtymile Formation as suggested by Austin & Wise (1994), this means that pre-Ediacaran (pre-animal) sediments — at least in the Grand Canyon — were formed before and not in the Flood as was suggested by Snelling (1991). Furthermore, placing the boundary here does not answer the question of *when* before the Flood the Chuar Group sediments were formed — whether, for instance, they were formed in Antediluvian times as suggested by Austin (1994) or during the Day Three Regression as suggested by Wise (1992). For this reason the authors examined the Chuar Group in the Grand Canyon to resolve these differences and answer these questions.

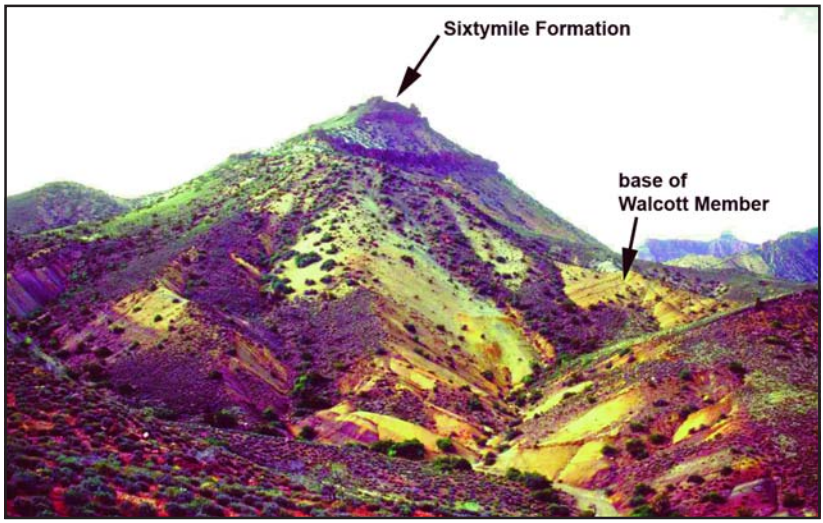

Figure 3. Nankoweap Butte. Photographer is standing just above the stromatolite bed in the basal Awatubi Member. The Sixtymile Formation caps the butte and most of the remainder of the butte is made up of the Walcott and upper Awatubi Members of the Kwagunt Formation (see Figure 2).

IN SITU KWAGUNT STROMATOLITES

In May 2001 the authors examined the Kwagunt and Sixtymile Formations (see Figures 1 & 2) near Nankoweap Butte (see Figures 2 & 3) in the Grand Canyon. Most significantly for the definition of the pre-Flood/Flood boundary, an extensive stromatolite bed was examined at the base of the Awatubi Member of the Kwagunt Formation[3] (Figure 4). This stromatolite bed is about 635 m below the base of Sixtymile Formation (Ford & Breed 1973), which Austin & Wise (1994) proposed as the pre-Flood/Flood boundary in the Grand Canyon (see Figure 2). Stromatolites in this spectacular bed have the overall shape of unopened toadstools, averaging 2.5 m in height and about 2 m across the top (Figure 5). A typical stromatolite from the bed is composed of a convoluted mass of divergent columns, each commonly 5-8 cm in diameter (Ford & Breed 1969).

The authors walked the strike of the bed for about 1.5 km, around the east limb of the nose of a south-southeast-plunging syncline. At a distance, the prominent bed could be observed on the west limb of the same syncline for a further 1.5 km or so (black arrow in Figure 4). The

Figure 4. The stromatolite bed. The arrows indicate the location of the stromatolite bed at the base of the Awatubi Member, Kwagunt Formation. Individual stromatolites distinguishable in the lower left corner of the photo are about 2 m high. The dark cliff just visible on the right and the dark band below and to the right of the black arrow are exposures of the basal red sandstone of the Kwagunt Formation.

average distance between the stromatolites along the entire traverse was less than 1 m (see Figure 4), and many were actually in contact with each other. Each of the hundreds of stromatolites observed in the bed was upright (i.e., with pedestal downward and the head upward; see Figure 5). In contrast, a majority of the stromatolites which eroded out of the softer surrounding sediments and rolled down hills, drainages, and streams, was oriented upside-down or askew of right-side-up by more than 45 degrees (e.g., Figure 6 in this note; Figure 9 in Ford &

Figure 5. Typical *in situ* stromatolite from the basal Awatubi Member stromatolite bed (geology hammer one third of the way up on the right for scale).

Figure 6. Typical orientation of a stromatolite eroded from the basal Awatubi stromatolite bed and rolled into a creek bed (geology hammer for scale).

Breed 1973). The fact that the stromatolite heads were much more massive than the pedestals explains the non-upright orientation of most transported stromatolites.

It is precisely the contrast of orientations of *in situ* and transported stromatolites which suggests that the stromatolites actually grew at the site and were not transported to that location.[4] If the stromatolites in the bed had been transported they would be oriented in a variety of orientations, mostly upside-down just as the stromatolites eroded out of the bed are oriented.

STROMATOLITES AND THE PRE-FLOOD/FLOOD BOUNDARY

The stromatolites in the basal Awatubi stromatolite bed are in the orientation expected of growth, and *not* expected of transport. However, if this were all the evidence we had available, we would consider it insufficient to come to a firm conclusion about the location of the pre-Flood/Flood boundary. After all, a number of *ad hoc* scenarios can be imagined to explain how such a bed could be produced allochthonously (e.g., emplacement of the entire stromatolite bed and associated sediments along low angle faults). To eliminate all of these scenarios a very

extensive and expensive investigation would have to be undertaken (e.g., demonstrating that the lack of reported evidence of low angle faults is because there really is no evidence of detachment in Kwagunt sediments). The convergence of other, independent and multiple lines of evidence (see Austin & Wise 1994) suggests that the pre-Flood/Flood boundary is at the base of the Sixtymile Formation, not far above the stromatolite bed. The basal Awatubi stromatolite bed, then, becomes yet another type of evidence consistent with this same conclusion. Although insufficient alone, by consilience of inductions, the stromatolite bed is consistent with a pre-Flood/Flood boundary in the Grand Canyon at the base of the Sixtymile Formation.

Stromatolites have been reported at other levels in the Grand Canyon, but only below the Tapeats Formation (e.g., see Ford 1990, Ford & Dehler 2003). Stromatolites have been found, for example, at other levels in the Kwagunt and Galeros Formations (see Figure 2). Of all the stromatolite beds, we chose to examine this particular bed because the stromatolites are large (identification is easy, even at a distance), and mushroom-shaped (orientation is easy to determine, and upright orientation is very difficult to achieve allochthonously). If, as we argue in this paper, this particular stromatolite horizon was produced autochthonously and the beginning of Flood sedimentation is above it — at the base of the Sixtymile Formation — then the other stromatolite horizons in the Kwagunt and Galeros Formations were also generated during pre-Flood times. Autochthonous stromatolite horizons should be found only below the pre-Flood/Flood boundary in the Grand Canyon, or put another way, the pre-Flood/Flood boundary should be located somewhere above the uppermost autochthonous stromatolite horizon in the Grand Canyon

WHEN WERE THE STROMATOLITES FORMED?

With the pre-Flood/Flood boundary at the base of the Sixtymile Formation, the basal Awatubi stromatolite bed was not formed in the Flood (*contra* Snelling 1991). In fact, the Kwagunt Formation and all strata below it are pre-Flood (i.e., the Chuar Group, the Nankoweap Formation, the Cardenas Lavas, the Unkar Group, and the underlying crystallines). When, however, were the stromatolites formed and under what conditions? There seem to be three logical possibilities for their origin — they were either created by God as fossils, or they were created

by God as fully functioning entities, or they developed as a result of natural antediluvian growth processes.

Created as Fossils — There seems to be a repulsion to this kind of suggestion in creationist circles, as if it is a simple-minded Gossean ploy to cut rather than untie the proverbial Gordian knot. For, it is argued, if God created the Awatubi stromatolite bed already in fossil form (or if He created a granite already cooled, or if He created a gastropod with a fully formed shell, etc.), what prevents a person from postulating that God created all the fossils as they are (*a la* Gosse)? However, young-age creationists *must* seriously consider this type of question at some point in their model. The wine created by Jesus at the Cana wedding feast (John 2:1-10) simulated wine produced by secondary process. The bread and fish created by Jesus at the feeding of the 4000 (Matt. 15:32-38) and the 5000 (Matt. 14:15-21) also simulated bread and fish generated by secondary process. Therefore, God *does* create objects which look like they developed by secondary process.

We see stromatolites form in the present and we see burial and fossilization occur in the present, therefore it is easy enough to imagine how the Awatubi stromatolite bed could have been formed by secondary process. The question before us is whether it is reasonable to assume that God would have created a stromatolite bed in fossil form.

On the negative side (i.e., determining what God would *not* create), it is common in young-age creation circles to believe that animal death did not precede the Fall. As a result, it is also common to believe that evidence of animal death did not precede the Fall. This in turn has led most young-age creationists to believe that the fossil record of animals postdates the Fall, and thus was not created in place by God. However, the death of plants (*sensu lato*, including fungi, algae, protists, and bacteria) before the Fall is not considered a problem, so the creation of a record of plant death may not be a problem either.

On the positive side (i.e., determining what God *would* create), the authors recognize at least two situations where God created with apparent age and history — organisms and provisional cycles. In general, in every case where God created objects in the Creation Week *and* created processes which generate identical or virtually identical objects, God will have created with apparent age and process. For example, God created fully functioning humans *and* the process of development to produce other fully functioning humans. As a result, the first humans

were created with apparent age and history. The same would be true of all organisms, for they were each created fully functioning *and* each created with their own process of reproduction.

Secondly, Wise (2002) has suggested that all steps of all provisional cycles were also created with apparent age and history. Plants, for example, require soil. However, plants deplete the soil. So, there is a cycle of soil eroding into sediments, sediments forming into rocks, and rocks eroding into soil to continually replenish the original soil. By definition this cycle — called the rock cycle — must generate soil very much like the original soil, or plants would die. Therefore, in the creation, fully functioning soil was created *and* the process to generate more soil was created *and* every step in the process of generating soil was also created. Therefore, the complete rock cycle was created with the appearance of age and history.

This would be true of every cycle which provides consumables to the created world (e.g., the nitrogen cycle, the water cycle, the carbon cycle, etc.). To include the biblical examples of the Cana wine and the feeding of the 4000 and 5000, we could generalize from these examples to suggest that God creates with appearance of age and history when either the entity is a fully functioning terminus of a unidirectional developmental process or the entity is a step in a provisional cycle. The Cana wine and the loaves and fishes, for example, were fully functioning entities (drink and food) at the end of developmental processes (human food processing procedures). The authors provisionally accept this prescription for all cases where we would expect God to create with apparent age and history.

Creation of the Awatubi stromatolites as fossils does not seem to fit into this prescription. A fossil stromatolite does not seem to be fully functional. Most (possibly all) stromatolites in our experience are generated as the result of the activity of microorganisms. This would be either photosynthetic bacteria (the case of all known large stromatolites) or chemoautotrophic bacteria (as in hot springs). Even if it were unmineralized, a buried stromatolite (without room for stromatolite growth and without access to light for its photosynthesizers) would not seem to be functional. Furthermore, even though fossil stromatolites could be food for microorganisms which eat organic material in the rocks (as suggested by Wise [1992]), it seems to be something of a stretch to say that fossil stromatolites are part of a provisional cycle. With what we

currently understand about both fossil and living microorganisms of the subsurface, we think it unlikely that God created stromatolites as fossils.

Created Alive — A second logical possibility is that the stromatolites were created by God and buried in subsequent sedimentary processes. A living stromatolite could be considered the fully functional terminus of a unidirectional developmental process, so it is conceivable God could have created living stromatolites looking very much like a stromatolite would look if it had developed through secondary process.

In the case of the Awatubi stromatolites, however, their creation in living state would require all the stromatolites stratigraphically beneath them to have been created as fossils. Although the authors did not closely examine the lower stromatolite units, the complex nature of the stromatolites in several of those layers would seem to suggest they are valid stromatolites. As in the case of the Awatubi stromatolites, their creation as fossils would seem to be outside the prescribed conditions for creation with apparent age and history.

Wise (1992) suggested that stromatolites may have been created on Day Two of the Creation Week and been transported and buried during the Day Three Regression. The apparently *in situ* nature of the Awatubi stromatolite bed, however, would seem to preclude any transport — whether in the Flood (*contra* Snelling 1991) or in the Day Three Regression (*contra* Wise 1992).

Formed by Secondary Process — We therefore conclude that the Awatubi stromatolites were not created — either in living or fossil form. Rather, they developed by secondary process sometime after the Day Three Regression and before the Flood. This is consistent with Austin's (1994) suggestion that the crystallines and the Unkar Group were formed in the Creation Week and the Chuar Group was formed in Antediluvian times.

HOW WERE THE STROMATOLITES FORMED?

Given the Antediluvian origin of the Awatubi sediments and contained stromatolites, what do they tell us about the conditions which generated them? The recent studies by Karlstrom et al. (2000) and Dehler et al. (2001) provide a starting point for discussion. The Chuar Group sediments consist of variegated mudrocks interbedded with laterally extensive, subordinate, meter-scale dolomite and sandstone beds consistent with

deposition in a shallow, wave- and tidal-influenced marine environment. The mudrocks are commonly organic rich and contain abundant marine microfossils (acritarchs). The fine-grained dolomites display microbial laminae, domal to columnar stromatolites, flat-pebble conglomerates, ripple cross-laminae, and various scales of interpreted desiccation cracks. The sandstones contain asymmetric and symmetric ripple marks (with local mud-cracked mud drapes), planar-tabular cross-beds with local reverse-flow indicators, and planar horizontal laminae. Careful facies analysis suggests a stacking of ~320 dolomite- and sandstone-capped meter-scale cycles (1-20 m thick) and non-cyclic intervals of uniform mudrocks (20-150 m thick). Nearly all cycles have mudrock bases. Karlstrom et al. (2000) and Dehler et al. (2001) interpreted this to mean that the Chuar Group (including the Awatubi stromatolite bed) was deposited in shallow subtidal to intertidal-supratidal marine environments. This would be consistent with the Chuar Group having been deposited in a shallow Antediluvian sea. The prolific *in situ* stromatolites with the prominent dolomite units would also be consistent with this interpretation.

In the present world, however, shallow seas are actually part of the continents — shallowly inundated continental shelves. Such shelf areas are rarely very far-removed from the subaerially exposed continent. Therefore the clastic sediments deposited in modern shallow seas come from the land and bury not only the organisms which live there but also organisms and parts of organisms washed in with the sediments from the land.

In the case of the Chuar Group (as is the case for all pre-animal Precambrian sediments) there are no evidences of man, animals, or land plants buried with the stromatolites. Given the fact that these sediments preserve organic remains — including bacteria — it cannot be argued they are not there because the sediments could not preserve them. The evidence suggests that no man, animal, or plant remains were available in the environments where the Chuar sediments were formed. It was precisely this kind of data which led Wise (1992) to suggest that stromatolite-bearing Precambrian sediments were formed in the Day Three Regression – i.e., before the creation of the land plants, animals, and man. As argued above, however, the authors believe the Awatubi stromatolite bed could only have been formed *after* the Day Three Regression — when man, animals, and plants were fully established on the land.

Shallow sea sediments which preserve organics well, but which preserve no higher organisms known to exist at the same time on the land, suggests that the relationship between shallow seas and land in the Antediluvian world was very different than is the case in the present. It may also indicate that the Chuar environment was not suitable for the survival of higher organisms.

Wise (2003) suggested that the Chuar-equivalent Pahrump Group sediments of the eastern Mojave Desert constituted an extensive fringing reef about the pre-Flood continent. Wise also proposed the reef-to-land "lagoon" was probably at least hundreds of kilometers wide, based upon the distribution of correlative sediments with a marine signature. Based upon fossils of animals designed very much like benthonic organisms of the deep sea, he also suggested that although the edge of the continent rose to the sea surface (to produce a fringing reef), the "lagoon" between the reef and the land was (probably in the middle) extremely deep (certainly sub-photic zone given the lack of light-utilizing organisms). Based upon similar lithologies and fossil sequences around the world, Wise also suggested that this fringing reef was laterally extensive — around many thousands of kilometers of Antediluvian continent. Finally, based upon thick intrusives and widespread evidence of hydrothermal activity, Wise concluded that the core of the fringing reef complex was hydrothermal in nature.

Wise's model might provide an explanation for the Awatubi stromatolites as well. A hydrothermal environment would be unsuitable for higher organisms and both the width and depth of the "lagoon" not only make it unlike modern geography, but reduce the likelihood that evidence of higher organisms on the land make it out to the reef sediments. A strongly biozoned Antediluvian world (as proposed by Wise 2002, 2003) might explain why even the cooler portions of the fringing reef were not colonized by higher organisms. Also even though modern hydrothermal environments are very much more restricted in size than the one proposed by Wise (2003), a wide variety of diminutive stromatolites – both inorganic and organic – are formed in modern hot springs (e.g., those in Yellowstone National Park). A much larger hydrothermal environment may be responsible for the higher variety and larger size of stromatolites in the Antediluvian world.

In the Grand Canyon there is even a heat source for such a hydrothermal environment. Below the Chuar Group and the underlying Nanko-

weap Formation are found the Cardenas Lavas (Figure 2). Thought to be derived from the same magma source as these lavas (and perhaps feeding them) are dikes and sills intruding the Unkar Group below the Cardenas Lavas. If these intrusive and extrusive rocks were rapidly emplaced after the initial creation they may well have taken a substantial amount of time to cool, potentially maintaining a heat source below the entire region for all or a substantial portion of Antediluvian times. Furthermore, if the heat was extracted by conducting water, the cooling of these magmas would have generated hydrothermal activity at the surface. This in turn may have prevented the establishment of communities of macroorganisms while maintaining optimum conditions for stromatolite growth. Perhaps also, such hydrothermal springs were some of the "fountains of the great deep" spoken of in the pre-Flood world (e.g., Genesis 7:11). In fact, the crustal weakness caused by such fountains may explain why they broke at the very beginning of the Flood. And, in the specific case of Grand Canyon, the Antediluvian expression of the Butte Fault may have acted as a conduit for hot waters to feed the Awatubi stromatolite forest until it broke on the first day of the Flood, generating a huge hanging wall as a source for Sixtymile sediments.

CONCLUSION

In our present understanding, the greatest function of a stromatolite is realized as it grows — i.e., in its being "alive". Based upon this, we suggest that although God may well have created "living" stromatolites, we do not believe He created fossil stromatolites. In the particular case of the stromatolites in the basal Awatubi Member of the Kwagunt Formation in the upper Chuar Group of the Grand Canyon, the presence of stromatolites in lower layers suggests that they were formed and buried by secondary process and not directly created. The upright orientation of the top-heavy Awatubi stromatolites suggests they were formed *in situ* and not transported. This in turn indicates that these stromatolites were neither formed during the Day Three Regression nor during the Flood, *contra* earlier claims of the authors (Wise 1992, Snelling 1991). We deduce that the Awatubi stromatolites were formed and buried after the Day Three Regression and before the Flood, which is consistent with Austin & Wise's (1994) assignment of the pre-Flood/Flood boundary in the Grand Canyon to the base of the Sixtymile Formation and Austin's (1994) assignment of the Chuar Group to the Antediluvian period.

The nature of the Chuar sediments with the absence of fossil evidence for higher organisms suggests that they were deposited in a shallow marine to intertidal environment very much different from shallow marine environments of the present. Wise's (2003) model of a laterally extensive fringing hydrothermal reef developed for Pahrump Group sediments of the East Mojave is provisionally accepted as an explanation for the origin of the Chuar Group of Grand Canyon.

Very little creationist research has focused on the pre-Flood world. There is much more to be learned about things unique to Antediluvian times, like organisms (e.g., the organisms which created the acritarchs), sedimentary structures (e.g., stromatolites), environments (e.g., hydrothermal fringing reefs), and geography (e.g., wide and deep continental margins). More discussion is needed on distinguishing direct creation from secondary process and Flood processes from pre- and post-Flood processes. Both authors intend to continue their examination of Precambrian sediments for more clues into the nature of the Antediluvian world.

ACKNOWLEDGMENTS

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ENDNOTES

1. Ford & Breed (1969, 1973, 1974a, 1974b), Elston (1979) and Elston & McKee (1982) consider the sediments to the east of the fault to be the Dox Formation, but an exposure of those same sediments traced to the south into Palisades Canyon shows them to overlie and interfinger with upper Cardenas lava flows.
2. Even Edwin McKee sees no evidence of time, even though he has seen time in numerous other locations in the Canyon where creationists do not see time — for example, the discussion in Austin (1994).
3. In Walcott's 1894 section, this is Bed 11' of the Upper Division of the Chuar Terrane (Chuar Group of Walcott 1883) of the Grand Canyon Series (of Powell 1876). In Ford & Breed's 1973 section, this is the spectacular biohermal horizon which defines the base of their Awatubi Member of their Kwagunt Formation (Wal-

cott's Upper Division) in the Chuar Group (*a la* Van Grundy 1951, *non* Walcott 1883). It is presumed (Ford & Breed 1969:118) that Dawson's (1897:208) *Cryptozoan* cf. *occidentale* was collected by Charles D. Walcott from this bed in 1882 (Walcott 1914:111) in spite of where Walcott (1895:319; 1914:111) indicated it came from (Bed 9 rather than Bed 11: see Ford & Breed 1969:117). If so, cross-sections of stromatolites from this unit have been figured by Dawson (1897:208, text-figure 3), Walcott (1899:Pl. 23, figs. 1-4; 1914:Pl. 15, figs. 1-6) and Rezak (1957:Pl. 20, fig. 5; Pl. 27, figs. 2-3). The surface of stromatolites from this unit has been figured more recently by Ford & Breed (1969:text figure 3; 1973:text figure 9; 1974a:text figure 3). The bed is represented in Figure 2 of this paper at the base of the Awatubi Member of the Kwagunt Formation.

4. The size and internal complexity of the stromatolites suggests to us that they are biogenically produced. However, the conclusions of our paper are unaffected by whether stromatolites are inorganic or biological in origin. Either mode of formation requires the passing of time (very possibly more time than is available during Noah's Flood) and produces top-heavy structures. The consistently upright, top-heavy structures would then suggest *in situ* extended growth whether inorganic or biologic genesis is hypothesized.

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ANNOTATIONS FROM THE LITERATURE

GENETICS: SELF-CORRECTION OF MUTATIONS

Lolle SJ, Victor JL, Young JM, Pruitt RE. 2005. Genome-wide non-mendelian inheritance of extra-genomic information in *Arabidopsis*. *Nature* 434:505-509.

Summary. HOTHEAD (HTH) is a gene that coordinates development of flowers parts so that they grow in the same location. When *Arabidopsis* plants homozygous for mutations that disrupt the function of HTH were bred, the offspring reverted to the ancestral functional form at rates from 1-10 %. This rate is far greater than would be expected from random mutations back to the ancestral sequence. Explanations such as additional copies of the HTH gene were eliminated as a possible reason for this along with other known mechanisms which might account for such an unexpected outcome. On the basis of this and anomalous findings in several other organisms, the authors propose a template driven process in which RNA from ancestors acts as a backup copy of the genome which is activated when organisms are stressed.

Comment. These findings are so extraordinary that they should be approached with some degree of caution before they are embraced. If they are born out, they directly challenge certain aspects of the neo-Darwinian synthesis. On an obvious level, production and storage of an ancestral RNA-sequence cache presents yet another level of complexity that is difficult to reconcile with the random mutation/natural selection mechanism. This also represents another of the many mechanisms by which mutations are prevented and in this case, there appears to be a direct challenge to at least one scenario for allopatric speciation. This strategy involves isolation of a small population in which certain mutations rapidly become fixed due to inbreeding. Even if the mutations are not necessarily beneficial, they might survive in isolation from the more fit ancestral population. If the phenomenon reported in *Arabidopsis* is generalized to other organisms, it seems to preclude isolation from more fit ancestral populations as the ancestral state will

appear at relatively high frequency in the isolated population, thus any mutant trait that is less fit than the ancestral state will be selected against and will not become fixed in the population. Even if a mutation is beneficial, when the organism is under stress it may revert back to the ancestral state at a significant rate.

GEOLOGY: UPHEAVAL DOME AN ERODED IMPACT CRATER

Kenkmann T, et. al. 2005. Structure and formation of a central uplift: a case study at the Upheaval Dome impact crater, Utah. *Geological Society of America Special Paper* 384:85-115.

Summary. Upheaval Dome is the remains of an extraterrestrial impact that produced a crater about 7 km in diameter, with a central uplift that was raised about 250 meters. Some 2000 meters of sediment has been eroded from the crater, leaving a remnant structure about 5 km in diameter. A large number of faults, folds, and clastic dikes are associated with the crater. The impact probably occurred during deposition of the Upper Cretaceous Mancos Shale. Alternative proposals for the origin of the crater, such as a salt dome or volcanic activity, do not explain the observed features

Comment. The origin of Upheaval Dome has long been in enigma, but it appears a consensus is forming that it was caused by an extra-terrestrial impact. Extraterrestrial impacts probably played an important role in the violence of the flood.

HUMAN PALEONTOLOGY: LARGE ABILITIES IN A SMALL SPACE

Falk D, Hildbolt C, Smith K, Morwood MJ, Sutikna T, Brown P, Jatmiko, Saptomo EW, Brunsden B, Prior F. 2005. The brain of LB1, *Homo floresiensis*. *Science* 308:242-245. Comment in *Science* 307:1386-1389.

Summary. The skull of *Homo floresienses*, the fossil pygmy human discovered in Indonesia, was subjected to three-dimensional computed tomography to reconstruct the brain size and shape. Results indicate a cranial capacity of 417 cm^3, yielding a brain/body size ratio similar to the australopithecines. Modern pygmies usually have cranial capacities greater than 1000 cm^3, ruling out this explanation for the Indonesian pygmy. The brain shape has several brain features distinct from the australopithecines, and resembling (Asian) *H. erectus* more closely than

any other known species. Other features, such as the highly convoluted frontal lobes, appear more like modern humans than like *H. erectus*. Certain features of the occipital region distinguish the Indonesian pygmy from *H. erectus* endocasts. The endocranium was distinctly different from the single modern microcephalic studied. The authors did not rule out the possibility that *H. erectus*, and by implication, *H. floresiensis*, might represent an unknown form of secondary microcephaly, but this possibility was not pursued. The authors conclude that the Indonesian pygmy does not appear to be a miniaturized version of either *H. erectus* or *H. sapiens*, but might share an unknown, small-brained common ancestor with *H. erectus*.

Comment. The data reviewed here seem to rule out the possibility that the Indonesian fossil was an ordinary pygmy modern human, or an australopithecine. Its ancestry may be linked with that of the erectines, fossils found from China to Africa. Island populations often show significant differences in size, but the report does not seem to favor interpreting *H. floresiensis* as an island dwarf of *H. erectus.* Exactly how these fossils fit into earth history is not yet understood, but their apparent ability to build boats and navigate to the Indonesian islands seems compelling evidence they should be considered as part of the human family.

ORIGIN OF LIFE: FORMATION OF PEPTIDE BONDS IN WATER

Leman L, Orgel L, Ghadiri MR. 2004. Carbonyl sulfide-mediated prebiotic formation of peptides. *Science* 306:283-286.

Summary. Carbonyl sulfide (COS) is a gas produced by volcanoes in low concentrations (less than 0.1%), and hence is a plausible component of a prebiotic earth. Reaction of carbonyl sulfide with L-phenylalanine in alkaline solution resulted in formation of phenylalanine thiocarbamate, which condensed to form dipeptides, even in the presence of water. Yield was higher in the presence of some oxygen, although oxygen is not necessary for the reaction. The reaction also produced dipeptides in buffered, filtered Pacific Ocean water. When an excess of oxidizing agent was reacted with phenylalanine thiocarbamate, an intermediate product in the reaction, yield of peptides was as high as 80%, with peptide chains up to five amino acids in length. Peptide bonds were formed in mixtures of L-phenylalanine and either

L-serine, L-leucine, L-tyrosine or L-alanine. The gas COS hydrolyzes in water, so is likely to be available only near volcanic sources. This is the first report of peptide bond formation under ambient temperatures and in the presence of water.

Comment. This report adds to our knowledge of chemistry, and shows that volcanic gases can condense L-amino acids into dipeptides. However, it does not do much for the hypothesis of the abiotic origin of life. Even if COS preferentially condensed L-phenylalanine from a racemic mixture (there is no report of this happening), the production of peptide chains does little to explain the origin information-containing proteins, or of living cells.

PALEONTOLOGY: FOSSIL DINOSAUR BLOOD VESSELS

Schweitzer MH, Wittmeyer JL, Horner JR, Toporski JK. 2005. Soft-tissue vessels and cellular preservation in *Tyrannosaurus rex*. *Science* 307:1952.

Summary. Parts of a dinosaur femur were demineralized in a weak acid, removing the hard bony tissue and leaving a mass of soft tissue containing apparent blood vessels. The vessels are soft and pliable, and in some cases retain their shape after repeated stretching. The vessels were compared with similarly prepared vessels from ostrich bone, and the two types of vessels were virtually indistinguishable. The vessels contain small round objects resembling cells with nuclei. Further analysis is needed to determine the possibility of preservation of molecular and subcellular components. The *Tyrannosaurus rex* specimen was collected from the Hell Creek Formation of Montana.

Comment. This is an extraordinary discovery that challenges our views of the rate of breakdown of organic molecules and opens the possibility that scientists may be able to recover organic molecules from other well-preserved fossils. Creationists will naturally wonder if this discovery is evidence of a young age of the fossils and evidence against long ages. However, it would be wise to be cautious when considering such claims. If organic molecules can be preserved for thousands of years inside fossil bone, as seems to be the case, we do not know how much longer they might remain preserved if the bones are undisturbed.

PALEONTOLOGY: RAPID PETRIFICATION OF WOOD

Akahane J, Furuno T, Miyajima H, Yoshikawa T, Yamamoto S. 2004. Rapid wood silicification in hot spring water: an explanation of silicification of wood during the Earth's history. *Sedimentary Geology* 169:219-228.

Summary. Alder wood has been observed to become petrified less than 36 years under natural conditions. The wood had naturally fallen into an overflow stream from Tateyama Hot Spring in central Japan. Water from the hot spring (70°C, pH 3) has a high silica content and silica granules are deposited in spaces in the wood as the water seeps through it. Pieces of wood experimentally deposited in the stream were nearly 40% petrified in seven years. Petrified wood produced by hot spring water was compared with Miocene fossil wood, and the two samples showed the same type of mineralization, indicated the same process was involved in petrification. Most petrified wood in the fossil record is associated with volcanic sediments, and it is likely that most fossil petrified wood was produced in a similar manner as hot ground water laden with volcanic ash permeated the wood.

Comment. This report confirms previous suggestions that petrification of wood might not take as long as had once been thought. Rapid mineralization is consistent with the excellent preservational state of some petrified wood. For additional comment, see www.grisda.org/origins/05113.htm; www.icr.org/pubs/imp/pdf/imp-379.pdf

RADIOCARBON DATING: CARBON-14 IN COAL

Baumgardner JR, Snelling AA, Humphreys DR, Austin SA. 2003. Measurable ^{14}C in fossilized organic materials: confirming the young earth creation-flood model. In: Ivey RL, Jr., editor, *Proceedings of the Fifth International Conference on Creationism*, August 4-9, 2003. Pittsburgh, PA: Creation Science Fellowship, p 127-142.

Summary. A major advance toward the agreement we can expect between time specifications obtained from the Bible and from scientific investigation has come from research on the carbon-14 content of coal. With the accelerator mass spectroscopy (AMS) technique, the RATE (Radioactive Age of The Earth) group has determined that all coal contains C-14 in [concentrations] between 0.1% and 0.4% (mean 0.247% + 0.11) of the C-14 concentration in the present environment.[1]

The rock levels from which this coal is obtained have been assigned geological ages ranging from 40 million to 300 million years. Since 40 million years is 7,000 C-14 half-lives, the conventional geological age assignments do not indicate real-time intervals, and the "oldest" coal has a conventional C-14 age around 57,000 years (0.1% of the present biosphere concentration).

Comment. The transition from the C-14:C-12 ratio in the pre-Flood biosphere, before the formation of coal beds, to its current ratio is evidently covered by conventional C-14 ages in the range between 60,000 and 4,000 years, since there is satisfactory equivalence with real time over the past 4,000 years. (Contributed by Robert H Brown, Ph.D.)

ENDNOTE

1. See also Russell BR. 2004. Evolutionary explanations for anomalous radiocarbon in coal? *Creation Research Society Quarterly* 41(September):104-112.

RADIOHALOS: POST-CREATION POLONIUM HALOS

Snelling AA, Armitage MH. 2003. Radiohalos — a tale of three granitic plutons. In: Ivey RL, Jr., editor, *Proceedings of the Fifth International Conference on Creationism*, August 4-9, 2003. Pittsburgh, PA: Creation Science Fellowship, p 243-267.

Summary. The presence of polonium radiohalos in granitoid rocks has been used to argue that the granites must have been created instantaneously, by fiat, when the earth was created. This study reports the presence of polonium radiohalos in three granitic bodies that intrude fossiliferous sediments. This discovery falsifies the hypothesis that granites containing polonium radiohalos must have been created by fiat.

The three granite plutons are the Stone Mountain granite in Georgia (Upper Carboniferous); the La Posta granite, located east of San Diego, California (mid-Cretaceous); and the Silurian Cooma granite in southern New South Wales, Australia. Each of these granite plutons was pushed into sediments containing fossils, showing that the granites formed after the fossils were buried. Hydrothermal fluids are probably responsible for transporting polonium atoms and their radon-222 precursor over short distances to sites where the local chemistry favored

their deposition. These sites became the centers of the developing radiohalos. Zircons in the granites likely served as the source for the radioactive atoms, which were frequently concentrated along cleavage planes in biotite.

Although the authors express their disappointment that the fiat creation hypothesis for granites is falsified, they note that the argument for rapid cooling of granites still stands. The flow of hydrothermal fluids might help explain rapid cooling of the rocks and rapid deposition of many metallic ore deposits.

Comment. Readers of *Origins* may recall the publication many years ago of a review pointing out the perceived flaws in the radiohalo argument.[1] This study conclusively confirms the position taken by *Origins*, and shows the value of hypothesis testing by creationists.

ENDNOTE

1. Brown RH, Coffin HG, Gibson LJ, Roth AA, Webster CL. 1988. Examining radiohalos. Origins 15(1):32-38. Available online at: http://www.grisda.org/origins/15032.htm

LITERATURE REVIEWS

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CAN SCIENCE REFUTE DESIGN?

Why Intelligent Design Fails: A Scientific Critique of the New Creationism. Matt Young & Taner Edis, editors. 2004. New Brunswick, NJ: Rutgers University Press. 238 p. Paper, $39.95.

*Reviewed by Cornelius G. Hunter, Ph.D.**

Intelligent design (ID) theory is not often given a scientific hearing, but in this edited volume the thirteen authors take on the scientific claims of ID from a variety of perspectives. Editors Taner Edis and Matt Young and the other authors marshal arguments from molecular biology, paleontology, information theory, cosmology, archaeology, and forensics in this frontal assault against ID.

The unanimous conclusion is that ID is fundamentally flawed. Much of the criticism, however, does not seem fatal to ID. Niall Shanks and Istvan Karsai argue that complexity can arise from purely local mechanisms. But their examples of Benard cells and wasp nests require a clever apparatus. Wasp nests require wasps and Benard cells require the right conditions. Do these really resolve the question of how complexity can arise?

Likewise, Gary Hurd argues that applying ID theory does not work as advertised in forensics and archaeology. Hurd's conclusion that "The real world is a hard place to sort out" (p 119) seems fair, but again, this does not seem fatal for ID.

Other authors, however, aim directly at the core of ID. Alan Gishlick makes a good argument that the avian wing defies ID. He argues that the fossil record provides good evidence for intermediate designs. ID theorists can argue that the avian wing is not irreducibly complex, or

*Author, *Darwin's God: Evolution and the Problem of Evil*

that the fossils leave out a wealth of detail. But they will need to justify those claims to rebut Gishlick's worthy contribution.

Even more direct is Ian Musgrave's attack on the poster child of ID, the bacteria flagellum. Musgrave agrees the flagellum is irreducibly complex and therefore did not evolve gradually, but he argues it could have evolved indirectly. This means that its components were pre-existing in other bacterial mechanisms, and that they came together to form the flagellum.

But does this really explain the flagellum's origin? First, the evolution of those spare parts, itself, is a mystery. But in addition to this, these spare parts, having evolved for different purposes, now must fit together sufficiently well enough to provide for a new function. It appears that Musgrave has merely shifted the complexity problem upstream.

Musgrave's, Gishlick's and Hurd's contributions are noteworthy. Many of the other authors seem to have stretched the evidence beyond its breaking point. Jeffrey Shallit and Wesley Elsberry, for example, contend that ID is confused in its view that complex biological structures (such as long DNA segments) are improbable. For instance, ID's probability calculations require an estimate of the set of possible structures. But how can we know what that set is? Or again, how can we judge the probability of one-time events?

Here Shallit and Elsberry argue against the obvious. True, these probabilities are difficult to calculate, but we do have substantial scientific knowledge to work from. Certainly, we do not know precisely the bounds of the biological design space or the probabilities of one-time events, but there is little question of what science is telling us. This is something akin to a flat-earther calling for more details after Magellan sailed around the world.

Problems also arise when Gert Korthof appeals to ambiguous data as powerful evidences for evolution. He cites mouse-human chromosome correspondence as "impressive evidence for their common descent" (p 42). But common descent does not require such chromosome correspondence. Likewise, Korthof believes that minor variations of the DNA code "follow the pattern of descent with modification" (p 46). Actually the pattern is ambiguous.

Despite this volume's contention that ID is flawed, there are some points in ID's favor that are hard to deny. Taner Edis writes that "it appears incredible that mere chance and necessity could give rise to intelligence; common sense suggests that intelligence must be a separate

principle in the world" (p 141). And Matt Young admits that the evolution of complexity on earth "is no doubt improbable" (p 27). Victor Stenger writes that "I do not dispute that life *as we know it* would not exist if any one of several of the constants of physics were just slightly different" (p 180, emphasis in original).

Their solution to this problem of improbability is that there could be many worlds in which to run the evolution experiment. As Matt Young points out, "we cannot rule out the possibility that there are other universes besides our own; and these, too, must be included in [ID's probability] calculation" (p 27).

Likewise, Victor Stenger argues that the universe's fine-tuning could simply be due to the luck of the draw. Instead of a universe, there may be a multiverse, and we are here only because this particular universe happened to support the evolution of carbon-based life.

Here the ID critics have finally defeated ID, but at what cost? To dispose of the problems that ID grapples with, they call for faith in unknown, unprovable, and unfalsifiable conjectures of other worlds. Given all the potential universes, with all their galaxies, anything becomes probable.

No longer do we need theories that are likely, they merely need to be not physically impossible.

In the hands of ID critics, science becomes a tool to argue for the unknowable. No longer do we use science to investigate what is likely. We need not constrain ourselves to what we can observe and what current science indicates. Design might be the obvious conclusion, but these critics would replace it with speculations that are neither verifiable nor falsifiable.

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PHILOSOPHICAL WEEDING

Thinking about God: First Steps in Philosophy. Gregory E. Ganssle. 2004. Downers Grove, IL: InterVarsity Press. 187 p. Paper, $16.00.

Reviewed by Ashby L. Camp, Tempe, Arizona

Gregory E. Ganssle is a philosopher at the Rivendell Institute and a part-time lecturer in the philosophy department at Yale University. He wrote this book to introduce ordinary people (non-philosophers) to philosophy and to help them think clearly about God.

In Part One (Introduction), Ganssle clears some weeds by explaining why the idea that one cannot "prove" the existence of God is less significant than might appear. If "prove" means to establish with unquestionable certainty, then one cannot prove God's existence, but neither can one prove that the Rocky Mountains exist independent of one's mind, that the universe did not pop into existence five minutes ago, or that other people have minds. However, one can provide good reason for believing God exists, just as one can provide good reason for believing that mountains are real, that memories are generally reliable, and that other minds exist.

Ganssle then explains how trusting in God and thinking about God go hand in hand. Believers know certain things are true by means of faith on the basis of the authority of the Scriptures or the church. What they know by faith they seek also to understand on the basis of reason. Whereas it is better to have knowledge by both faith and reason, one does not know less truly or to some inferior degree if one knows only by means of faith in a reliable authority.

The final weed he clears is the notion that one must be neutral in the sense of having no ideas or beliefs about God in order to be open-minded in thinking about God. Virtually everyone has ideas and beliefs about God. The test of open-mindedness is whether one is willing to

identify one's starting assumptions (prior ideas and beliefs) and open them to criticism.

In Part Two (Reasons to Believe in God), Ganssle presents three lines of evidence that he believes make it more likely that God exists than that he does not. He argues: (1) that the existence of the universe is better explained by a first cause who is a powerful person, outside space and time, (2) that the nature of the universe is better explained by a cause that was an intelligent designer who had some interest in a universe that was suitable for life, and (3) that the nature of moral facts indicate that there is a purpose to our lives that comes from outside human culture.

Ganssle believes Darwin has rendered unsound the argument from apparent design in living things to the existence of a designer. Though Darwin's story may not be true, he accepts that it provides a *plausible* explanation for how aspects of living things could appear to be designed without actually having been designed (like the "Old Man in the Mountain" in New Hampshire). Since Darwin's story is available only for things that reproduce, it has no effect on the argument for design from the fine-tuning of the universe (argument 2).

Of course, creationists and many in the intelligent design community challenge the notion that Darwin's story is a plausible explanation for the appearance of design in nature. Ganssle does not explain why he accepts Darwin's story as plausible, but he seems to be relying on the fact "most biologists think that some story pretty much like Darwin's is the way things happened."

In Part Three (God and Evil), the author tackles the philosophical problem of whether the existence of God and evil can be reconciled. He argues that the existence of evil in general does not disprove God's existence (Mackie's argument) because God may have a good reason for allowing evil. He argues that the existence of particular evils for which we can conceive no good reason does not make God's existence improbable (Rowe's argument) because it is reasonable to suppose that God will have reasons for allowing evils that we cannot grasp.

In Part Four (What Is God Like?), Ganssle explores what God can do, what he can know, and whether he communicates. He explains that God cannot do what is logically contradictory (e.g., make a square circle) and that God can know every truth, even the future (though how one analyzes God's knowledge is linked to one's view of God's relationship to time). He ends with suggesting that, in light of what one

can infer about God's existence and nature, it is reasonable to think that God would reveal himself to the human race through language.

This is a good basic introduction to some important philosophical questions about God. Ganssle is a believer who knows the terrain and communicates clearly. Though his purpose in writing was broader, the book will help prepare Christian undergraduates to deal with questions that on too many campuses are presented as unanswerable objections to the faith. Those who are active in Christian apologetics will see much that is familiar, but they also can benefit from Ganssle's analysis of various issues. For those who wish to dig deeper, there is a short list of recommended reading.

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SPREADING OUT THE HEAVENS

The Origin of the Universe. Emerson Cooper. 2003. Box 428, Enumclaw, WA: Pleasant Word (Winepress Publishing). 191 p. Paper, $16.00.

Reviewed by Robert H. Brown, Loma Linda, California

Emerson Cooper is a retired professor of chemistry from Oakwood College in Huntsville, Alabama. In *The Origin of the Universe*, Dr. Cooper goes beyond time considerations to treatment of specifications in the Bible that relate to Big Bang cosmology.

The front cover describes the book as "A combined Biblical and scientific perspective"; and illustrates expansion of the universe from an "infinitely small point of space...packed with matter squeezed to infinitely high density" (p 105) at primordial creation, past Creation Week at about 4000 BC, to the present size beyond the range of the best telescopes. Readers of this book will appreciate its collection of Bible references that may be intended to have cosmological intent. Chapter 6 gives a history of perception concerning the nature and history of the universe from Greek philosophy around AD 150 to physicist Albert Einstein and astronomer Edwin Hubble in the 20th century.

Pivotal to Cooper's treatment is the interpretation of Genesis 1:1 as referring to the origin of the universe. However, using the definitions of heaven and earth in the body of the following text (Genesis 1:8-10), this verse may, instead, be viewed as merely an introduction to the text which concludes with the summary statement in Genesis 2:1-3. Either interpretation allows the Big Bang hypothesis. In its present form this hypothesis places the creation of the universe around 15 billion years ago. I expect that most readers of Chapter 2 will be surprised at the number of statements in the Bible that may be related to the origin of the universe. Bible writers after Moses evidently expanded the term

heaven(s) to often include what may be seen looking upward through the atmosphere of Earth.

According to Cooper's model of cosmology, "At the moment of creation all of the cosmic matter (the ninety-two chemical elements) that would become the components of galaxies, stars, and planets came into existence by fiat creation...ex nihilo..." (p 78). What about the elementary matter used in Jesus' miracles, such as feeding 5000 men besides the accompanying women and children? Did He "scrape up" necessary elementary matter, or create it as needed? Might the creation of the universe have been an ongoing process in which elementary matter was created as needed?

On each of p 12-13, 104, and 170, seven Bible texts are quoted which in the KJV portray God as *stretching out* or *spreading* the heavens (Job 9:8; Psa 104:2; Isa 40:22; 42:5; 45:12; Jer 10:12; 51:15). Four of these texts are also quoted on p 39. In the Preface, Cooper affirms that according to these texts "The unequivocal testimony of the Bible...supports the idea of an expanding universe" (p 12). However, allowance must be made for the likelihood of these texts using literary style to convey the expanse of the atmosphere created on Day 2 of Creation Week (Gen 1:6-8). The New English Translation uses *heavens* in three of these texts and *sky/skies* in the other four, as also in Isaiah 48:13. In two of these texts the stretching is described "as a curtain" or "like a curtain."

The Big Bang hypothesis is currently the most widely accepted scientific explanation for the origin and continuing development of the universe. Whether additional observations or more advanced theorizing will bring a substitute hypothesis is uncertain, but possible. In 1929 Fritz Zwicky proposed the "tired light" hypothesis. According to this concept light photons gradually lose energy with age. Light photons from more distant stars will have lost more energy than photons which have had less distance to travel, and accordingly will have a greater red-shift. This red-shift will not represent a Doppler effect from increased recession speed, as required by the expanding universe model. A note in *Astronomy* 14:64, August 1986, claims that in four different observational tests the tired light hypothesis provides a better explanation than does the expanding universe model.

Without dispute as to whether the universe is, or is not, expanding, I contend that universal gravitation does not require either one or the

other, as stated on p 12 and 169. Objects held in orbit by gravitation remain so indefinitely, unless there is an additional force which changes their relative energy of motion (e.g., satellites around planets, planets around stars, stars around galaxy centers).

For the benefit of readers, two changes on p 97 would be helpful. A dark-line spectrum is produced when any light with a continuous range of color is passed through a gas. Reference to electrons moving "up and down" in producing a light photon describes a graphic representation of the process, which is a transition between two energy states of an electron about the center of an atom.

The reader of p 171 who is unfamiliar with statistical terminology should understand that the probability of a bacterium being produced by uniform random process is the same at the end of 15 billion years as it is at the beginning. Expressing the reciprocal of this probability in units of time makes no specification of actual time, but is an aid in conceptualizing the relative degree of improbability.

Genesis 1:14 specifies *seasons* as a feature of planet Earth from Creation Week onward. We can expect that in Creation Week God arranged for the maximum portion of planet Earth's surface to be suitable for support of organic life. That would require direct radiation from the Sun to sweep back and forth over the surface of Earth, as well as ocean and air currents to aid in distributing heat. This is accomplished optimally by the present tilt of the earth's axis. Therefore I must take exception to treatment of the tilt of Earth's axis of rotation with respect to its plane of orbit as a "major [result] of the flood," as is done on p 128-130.

In conclusion, *The Origin of the Universe* provides challenging reading from which significant and valuable insights may be obtained.

GENERAL SCIENCE NOTE

THE RAINBOW IS ALL IN YOUR HEAD

Leonard Brand and Ernest Schwab
Loma Linda University

If a tree falls in the forest and there is no one there to hear it, does it make any sound? This question can be the basis of humorous arguments, perhaps just for the sake of arguing! But when we bring an understanding of the physiology of the human brain and sense organs into the picture, the question becomes worthy of some serious consideration. In fact, it can yield fascinating insights into the nature of sound, color, taste, beauty, love, and the Creator's inventive genius.

When a tree falls, its branches push the air aside and strike other trees on the way down, finally smacking the ground with earth-shaking force. All these collisions of object against object or object against the air generate trains of wave forms that vibrate through the air. These traveling vibrations of molecules, or sound waves, in the air are controlled by precisely measurable physical laws. The size and nature of the colliding objects and the force with which they collide, control the shape and complexity of the sound waves which move through the air at a constant speed, precisely controlled by physical law. So it appears that sound is entirely controlled by the laws of physics. But that is a premature conclusion, because so far all we have are vibrations of air molecules. How do these vibrations become sound?

THE EAR

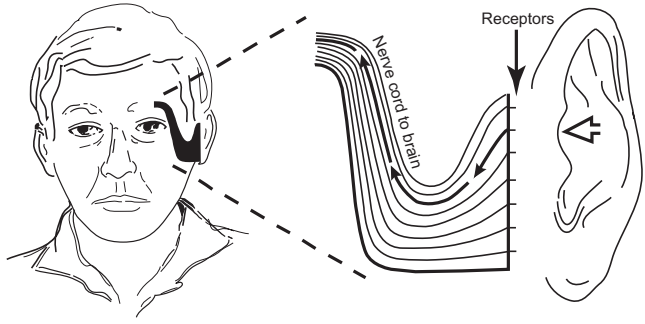
Now consider the ear of a logger working in the forest. The sound waves, or vibrating air molecules, cause his ear drum to vibrate. This vibration is conveyed to the inner ear, where a long row of receptors respond to the vibrations. The receptors at one end of the row respond to long-wavelength vibrations, creating the perception of low-pitched sound. At the opposite end are receptors activated by short-wavelength vibrations, generating a perception of high-pitched sounds. In between are many other receptors, each tuned to respond to a specific band of intermediate wavelengths, and each ultimately connected to the brain by a nerve. Signals from these receptors are processed along the way as

they travel to the brain. There the signals activate a portion of the brain that interprets the signals for us, allowing us to perceive the sound.

What is the nature of the signal that travels along each of the nerves connecting an inner ear receptor to the brain? Is sound carried along the nerve? No, each nerve transmits only an electrical impulse, or signal. If a long-wavelength receptor is stimulated by a long-wavelength vibration, it activates its connecting nerve, and an electrical signal quickly travels to the brain (Figure 1). The electrical signals from a long-wavelength receptor and the signals from a short-wavelength receptor are physiologically the same. These electrical signals change only according to how *loud* the sound is. If the sound becomes louder, signal frequency (signals per second) increases. Figure 1 shows how each inner-ear receptor has its own nerve connection to the brain. The only way the brain can tell if a signal indicates a long or a short-wavelength is by which nerve the signal comes through. So far we still have no sound — only vibrations of air molecules, and movement of electrical impulses along nerves.

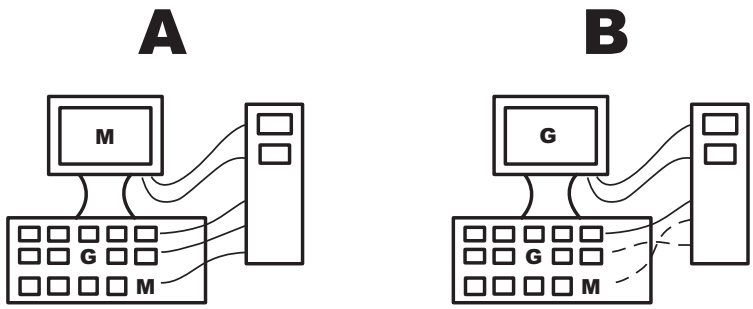
When the brain receives the electrical impulses, we hear sound, and the process is complete. But since the connection between the ear and the brain is only by electrical impulses, the sound of a falling tree has to come from somewhere within the brain. There was no sound traveling along the nerves — only electricity. Somehow the brain receives the incoming pulses of electricity from numerous nerves, and translates them into the conscious perception we call "sound." What we perceive as sound is strictly a sensation generated by the brain, and is not predetermined by the physical laws that govern the vibrations of air molecules.

FIGURE 1



To illustrate why sound is not specified by those physical laws, compare the nerve connections from the ear with a computer keyboard. When we press the key with the letter M, a signal is sent to the computer processor, it is manipulated there, and the letter M appears on the monitor (Figure 2A). However, a computer expert can easily change the connections between keyboard and processor, so that pressing the M key results in a G appearing on the monitor (Figure 2B). The result of a key

FIGURE 2



press depends upon the electrical connections between keyboard and processor (the computer's brain), and these connections are contingent — based on conscious choices by the programmer, not on specification by any natural law. The letters M or G as they appear on the monitor are made inside the computer. Since we can change the connections and make a G appear from pressing the M key, it is clear the letter that appears is the result of the connections — it depends on which wire goes from the keyboard M into the computer.

In the same way, the sound sensation generated by the brain seems to be controlled by specific nerve connections from the ear. If we could reverse the connections of the long wavelength and short wavelengh receptors (Figure 3), we would hear the long-wavelength vibrations as high-pitched sounds, because the part of the brain that generates the sensation of high-pitched sound was being stimulated as a result of our having changed the wiring.

There is one important difference between the computer and the ear. The fact that the key with M on it is at the bottom middle of the keyboard is also arbitrary, based on a decision of the computer designer. The anatomy of an M key and of a G key is exactly the same, and the

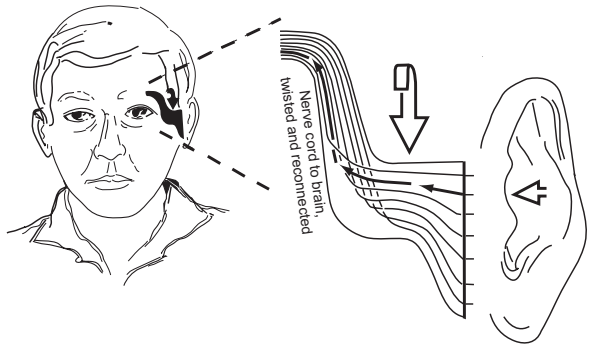


FIGURE 3. The short-wavelength signal indicated by arrows is now being received by a neuron that is going to a brain center which will interpret it as a low-pitched sound. Likewise, long-wavelength signals will be interpreted as high-pitched sounds.

determination of which letter comes from which key is decided in the computer processor. However, the receptors in the ear are not all the same. Each one is constructed to respond best to a particular frequency of vibration. Thus the receptors are frequency-specific, but the nerves connecting the receptors to the brain are not frequency specific, and thus our conclusion above remains — unplugging the "cord" from the ear and reversing the connections would reverse the nature of the sounds we hear. A piccolo would sound like a tuba and the tuba would be perceived as giving out piccolo sounds.

VISION — THE EYES

Now consider the eyes. Light rays from the sun bounce off all the objects around us, and some of those rays hit the light receptors in the back of our eyes, on the retina. The leaves on a tree absorb much of the light that strikes them, but the green light is reflected back. Those rays strike the retina, and we see the leaf as green. A red dress absorbs all the light except red. It reflects the red rays, and we are dazzled by the beauty of the bright red color of those reflected rays.

When a light receptor is triggered by a light ray it sends a message to the brain. What type of message is that? It is an electrical impulse, of the same type as the electrical impulses sent by the ear in response to the vibrations it received. So if the same electrical impulses carry information about sound waves and light rays, what prevents our brain from becoming confused? It is not confused for the same reason a computer

knows the difference between a signal from the M key and a signal from the G key — the wires from those two keys go to different places in the computer. In the same fashion, nerves from the eye go to a specific place in the brain, and that part of the brain interprets them as light. The enormous number of receptors in the eyes are all connected by specific nerves to the brain, and the brain is programmed to interpret the spatial and color information coming from the light receptors, but all of the information reaches the brain as electrical impulses.

The retina has four broad classes of photoreceptors; one class for black-and-white vision, and three for color vision. The three classes of color receptors are sensitive to wavelengths corresponding to red, green and blue light respectively. Nerve networks in the retina of the eye do some preliminary analysis of the visual image, and then the many individual optic neurons are stimulated to send electrical impulses to the optic cortex, the vision processing center in the brain. The only reason the brain knows how to interpret the incoming electrical signals is because each different color receptor type, in each part of the eye, transmits its information over specific nerve connections to specific targets in the vision center. There pure colors and mixtures of colors are perceived as combinations of firing of these different receptor populations. The vision center processes this information by picking it apart into categories of information. It generates "layers" of information — information about color, about shape, information about motion, about visual depth, etc. These "layers" are superimposed upon each other to recreate the visual image. This can be compared to what happens in a computer-graphics package such as Adobe® Illustrator® or Jasc Paint Shop™ Pro®, that divides an image into multiple layers and superimposes them so we see a single integrated image.

Since long-wavelength light rays and short-wavelength light rays both communicate to the brain via the same type of electrical signals, the brain's mode of interpreting those signals is not predetermined by natural law, but is the result of instructions (like computer software) in the brain, programmed to interpret the electrical signals from each optical nerve and produce the correct visual image. Another way to say this, is that our perception of red or green colors is the result of an information processing system that is not predetermined by the laws of physics, but was designed by an intelligent Inventor.

One might argue that the wavelengths of light which produce various colors are well understood by physicists, and that it is very predictable

which wavelength will be seen as which specific color. That statement is partly true. The spectrum of visible light wavelengths is the result of precise physical laws, and the way in which those wavelengths are selectively reflected by different substances is a very consistent feature of nature. It is also true that we can predict which wavelength of light will be seen by us as green — usually. But the exceptions are a key to unraveling this puzzle. The fact that most of us see green in response to the same wavelength only confirms that the brain is very reliably programmed — we can count on it to see green the same way all the time. But it is not that way for everyone; those who are color blind cannot tell distinguish red from green. When those individuals' eyes are stimulated by light, do the laws of physics change? Of course not, the wavelengths of light reflected from tree leaves are still the same. The difference is in the interpretation occurring in their brains and optical systems. For those persons the instructions for interpreting red and green wavelengths are defective, so their perceptions of the colors are quite different. Fortunately color blindness is not a common problem, and in the majority of cases is limited to red and green. This tells us that the light-interpreting center in the brain is usually extremely stable and reliable, but it still appears to be dependent on the organization of the brain. In other words, the colors we perceive are not specified by the laws of nature, but they result from the way the Creator designed our brains. Color, as we perceive it, only exists in animal species whose brain generates those perceptions of color. Thus the rainbow is all in our heads. Any type of light-detecting instrument we could possibly invent can only measure the wavelength of light, it has no way of knowing what colors we will perceive when our brain interprets those wavelengths.

Now reconsider the experiment we discussed before — unplugging the nerve cord from the ear and reversing it. This time, imagine we could unplug two nerve cords, one from the ear and one from the eye, and exchange them. Now the sound processor in the brain would be receiving electrical signals from the eye, and the visual processor is getting its electrical signals from the ear. What would we see and hear? We would "hear light" and "see sound!" The brain would no doubt be very confused, because the visual processor lacks the proper software to understand sound information. However, we would see some type of pattern, generated from the sound signals. We would also hear strange sounds!

One other aspect of vision is truly amazing, but we take it for granted. The eye can be compared to a camera, with a lens that focuses an image on the retina at the back of our eye. We do not see that image as a flat picture on the back of our eye. The retina only receives the light signals, which it sends to the brain, and the brain performs a feat that seemingly defies explanation. The brain projects our consciousness of the image out into space in front of us, and we see the image where the objects actually are. We see a tree trunk some distance in front of us as we walk through the forest, but there is no solid connection from the tree to us. We only perceive the light waves reflected from the tree, and unless we touch it physically, we are only seeing an image constructed by our brain, inside our head. Our brain puts together the visual signals received by our eyes, integrates them with other spatial information we have learned through experience, and generates a conscious perception of an image out there, exactly where the object really is.

Though this complex process is accomplished by our brain — so accurate and predictable that we have learned to trust it, and move aside before we run headfirst into the tree trunk. It is so accurate that a baseball player can process the constantly changing image of a little white ball sailing through the air at high speed, integrating that with speed and directional information sent from his legs to his brain, while running at top speed, further analyzing data on the location of his gloved hand, which is perhaps outside of his visual field part of the time, and is able to bring the glove into the path of the ball with a high degree of accuracy! No combination of physical laws alone can explain the brain's ability to analyze all that information, and project our consciousness of the image into space to where the ball really is — it is an intelligent information analysis system invented and placed into our brain by the Great Inventor.

A few people possess a curious ability that sheds more light on our brain's processing of visual information, and reveals the types of crossover that can occur in the brain between categories of signals that are usually distinct and separate. Our brain interprets spatial information, like the shapes and locations of the letters that you are reading. Since these letters are all black, they all look the same to you and me. Not so with some people, whose brains mix together shapes and colors so they see letters in color, with a given letter always having the same color (Cytowic 1989, Grossenbacher & Lovelace 2001, Ramachandran & Hubbard 2003; see also Beeli et al. 2005). If you hear two individuals

arguing whether R is blue or green, you know they both have this rare condition, called synaesthesia.

DOES A BAT SEE WITH ITS EARS?

Incredible brain processes are not confined solely to humans. Bats have an incredibly accurate sonar system. The bat gives out high-pitched cries, above our range of hearing. Those sounds strike objects and the echoes bounce off in all directions. A small percentage of the echo reaches the bat's ears, and the bat can determine from that echo exactly where the object is. Scientists have calculated the efficiency of bat sonar, compared to man-made sonar and radar systems, taking into account the weight of the system, how small an object it can detect, and the maximum distance from which it can detect that object. The bat's sonar is amazingly efficient. A bat in total darkness can avoid wires a tenth of a millimeter in diameter, catch tiny insects on the wing, and even distinguish between an insect and a little pebble the same size as the insect, using its sonar. Thousands of bats can fly side by side through a cave, all giving off high-pitched cries. Each bat can distinguish its own echo and navigate through the crowd.

One interesting question to ponder is what type of information is the bat sensing? Is it hearing echoes as sound, just like we hear echoes? Does it hear echoes and know how to interpret where that echo is coming from? Or does the bat's brain analyze these echoes and interpret them as a visual image? From what we have discussed so far, can you see that whether the bat "hears" the echoes or "sees" a visual image indistinguishable from the image created by its eyes is entirely a function of how its brain is programmed to interpret the electrical impulses reaching the brain? We do not know how to get inside a bat's brain and detect what it is seeing or hearing, but there is no physical reason why a bat might not produce a three-dimensional **"**visual**"** image from the information in the echoes from its echolocation cries. Maybe a bat does see with its ears!

WHAT IS LOVE?

Think back to a memorable moment when you were standing hand in hand with someone you love, taking in the sounds and colors of a beautiful mountain scene. What is the source of the feelings of love and companionship that made the colors and sounds more vivid? What laws

of nature specified those feelings, and the experiences, memories, and thoughts in your brain that were the foundation of those loving feelings? The tender touch of your loved one's hand only stimulated touch receptors and sent electrical signals to specific places in the brain. This clinical description does not sound very romantic!

If we stop there we understand physics and chemistry, but not love and romance. That whole experience of love was not predetermined by any laws of physics or chemistry. True, laws of nature hold together the molecules that make up our body, making life possible. But only your brain was able to know the meaning of that *particular* touch, and to generate a unique feeling, different from what would have been produced in response to a touch from some other soft but impersonal object or person. Friendship, companionship, and love are a beautiful system of relationships that depend on the information analysis system invented by the Creator and placed in our brains, just like the brain centers that control our perception of sound and color.

We believe love exists because the Creator loves us and wanted us to experience relationships that transcend mere physics and chemistry; relationships that bring to us the kind of joy and romance that only a personal God understands and can share with us to brighten our lives. Love is an invention from God, programmed into our brains. Love, like the rainbow, is all in our heads.

THE GENIUS OF OUR SENSORY WORLD

Our entire sensory world of sounds, sights, colors, and smells and the magic of love is produced by the structural information in a brain, not only by the laws of sound or light waves. The next time you attend an orchestra concert, or sit at the edge of a forest in the evening, listening to the chorus of bird songs and watching the changing colors of the sunset blazing across the sky, think about the source of all this captivating sensory input. The varied instruments in the orchestra and the different types of bird songs are producing vibrations in the air, each in their unique ways, while refracted light rays of varying wavelengths produce the sunset. That is all fascinating physics in its own right, but it does not explain our appreciation of a symphony or a gorgeous sunset! The captivating sound of the symphony and intoxicating colors of the sunset are produced only by a brain. They are gifts that the Creator gave to us by way of the instructions and connections He programmed into our brain.

Electrical impulses are translated by the brain into exquisitely beautiful perceptions that we want to share with someone we love.

If a tree falls in the forest, and there is no one there to hear it, does it make a sound? No, it vibrates the air, but sound is only produced inside a brain.

WHAT DOES IT ALL MEAN?

How did animals receive the equipment to generate sound, vision, smell, and romance? For over a hundred years science has been explaining this as the result of mutation and natural selection. Purely impersonal natural processes are believed by many to be the cause of all of our sensory abilities. But mutations do not know what an animal needs; they occur strictly by chance. It is proposed that along with many detrimental mutations, some mutations occurred which just happened to very slightly increase the analytical ability of our brain, and individuals with these improvements had a better chance of surviving. The theory of natural selection says that over long time periods, many of these individual, slight improvements added together to produce our amazing brain. In this view, there was no intelligent designer, but the apparent design was only produced by chance plus the creative action of natural selection (see, e.g., Dawkins 1986, 1996, 1998).

This article has discussed fascinating insights into the nature of sound, color, taste, beauty, love, and the Creator's inventive genius that produced them. This is opposed to the suggestion that these same senses arose from the impersonal natural processes offered by darwinian science. How can we be so sure we see the Creator's hand at work? Actually we can not prove it, just as no one can disprove it, but we believe it is a perfectly reasonable philosophical choice.

Science can contribute much toward understanding how our brains and other natural systems work. It can even discover the processes that make changes in animals, plants, and in brains. Science does best at understanding how things work, and the observable mechanisms behind changes that occur. Although there is abundant evidence for microevolution and the development of new species, there is a serious lack of convincing evidence for a genetic mechanism that could produce a new organ system or change one basic type of animal into another (Brand 1997, Spetner 1998). We cannot prove that it is impossible for a brain to evolve without an intelligent designer, but naturalistic science carries the heavy burden of convincing us that it could happen.

Many scientists puzzle over their lack of success in convincing the majority of people that a creator is not needed. They believe that evolution alone can produce living systems, including the brain with its abilities that seem to go far beyond the needs of survival, and they have difficulty understanding why so many others reject that conclusion. One reason for science's notable lack of success at convincing the majority of us to reject the Creator is that even the very best science lacks the evidence to demonstrate that impersonal natural processes can invent the brain with its ability to generate such a symphony of sound and sight and of romance that delights us and makes life beautiful (see references by Dembski and by Johnson on intelligent design).

In the modern scientific worldview the impersonal laws of chemistry and physics are the ultimate reality. But we believe God is a personal Being, and in His universe personal relationships are of ultimate importance. God is the inventor of the laws of nature and is the master of those laws, and uses them consistently to run the universe. But they are not His ultimate reason for creating, or His most valued creation. The laws of nature are only His servants, to provide a universe to support the more important realm — living, reasoning beings who can experience relationships.

Humans can never comprehend God until we understand and accept His nature as a personal Being to whom natural law is merely a means to support His highest priority in the universe — loving relationships, between Himself and beings who can share those trusting, loving relationships because they freely choose to do so.

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