# JOURNAL OF CREATION

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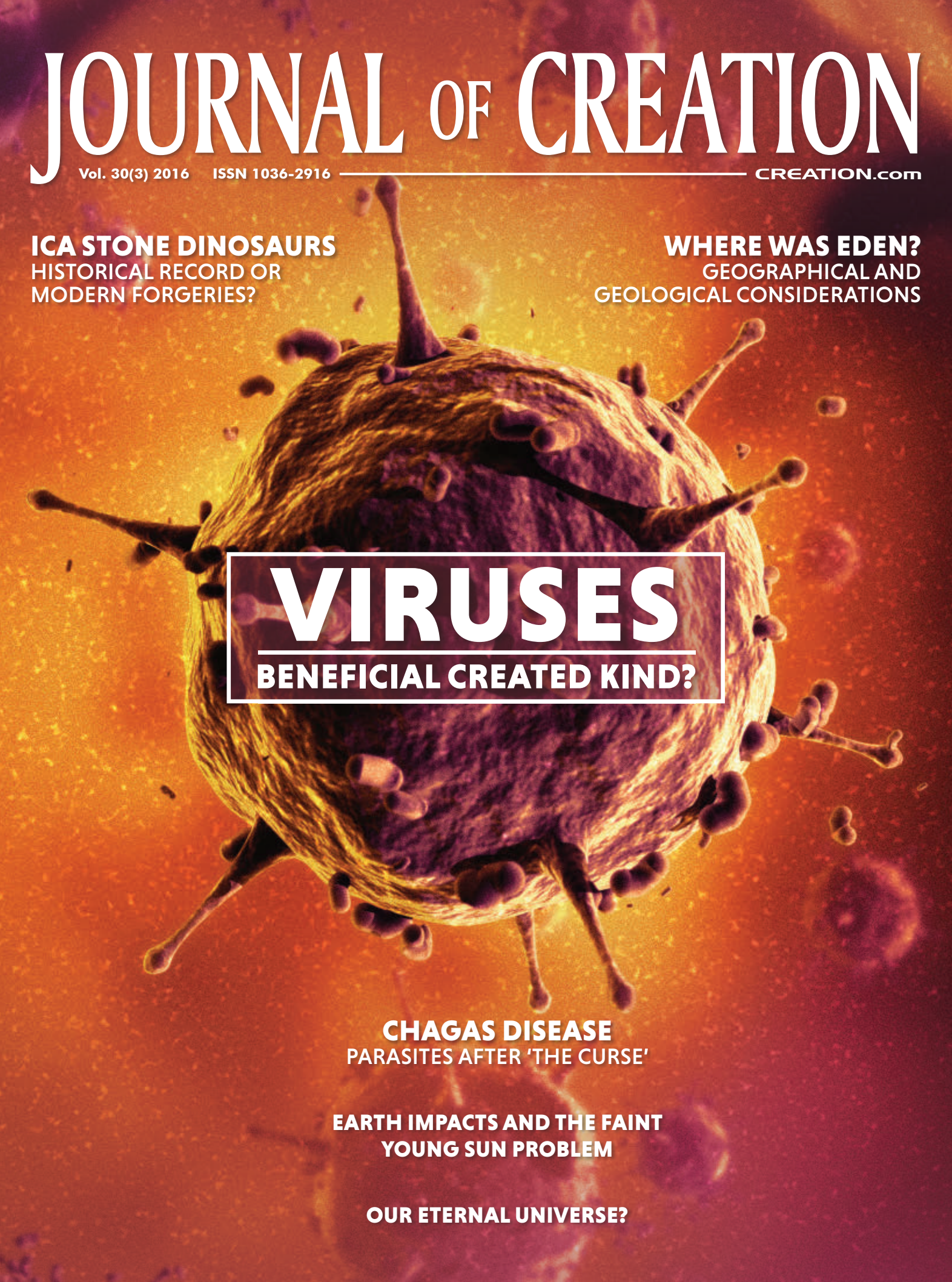

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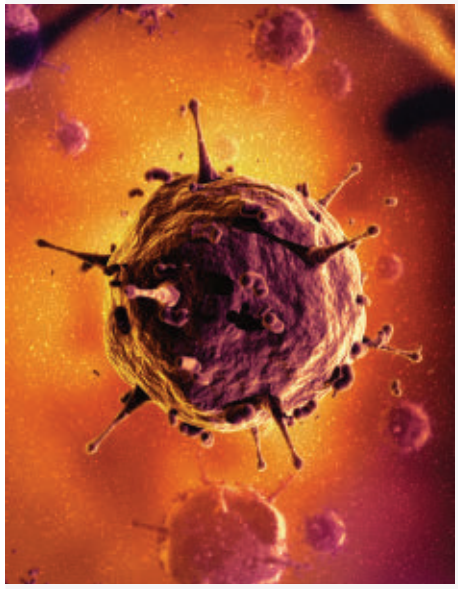

# JOURNAL OF CREATION

An international journal devoted to the presentation and discussion of technical aspects of the sciences such as geology, biology, astronomy, etc., and also geography, archaeology, biblical history, philosophy, etc., as they relate to the study of biblical creation and Noah's Flood.

COVER: Artistic impression of a virus

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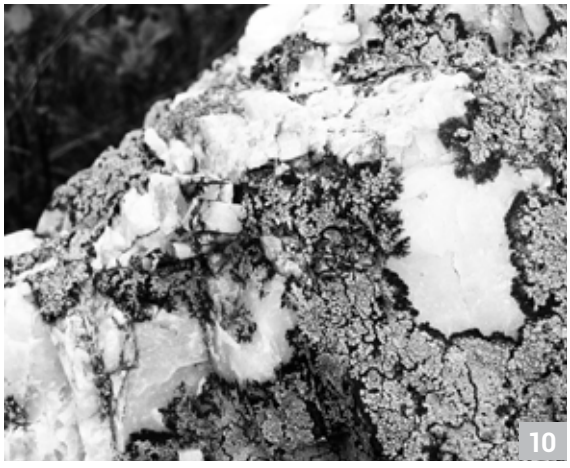
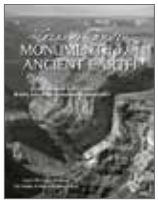
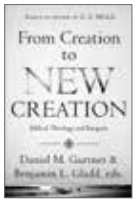
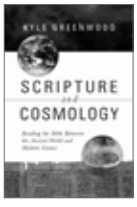
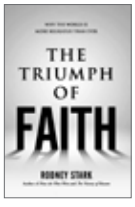


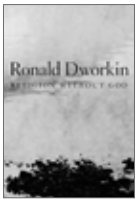

*Lichenometry is an example of the reinforcement syndrome, a common problem in historical science.*

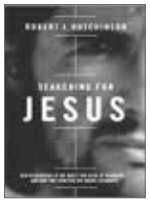












## COUNTERING THE CRITICS

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*Does* Homo naledi *represent 'robust human' individuals that suffered from a non-genetic developmental pathology?*

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For instructions to authors, see the last page.

# Chagas disease

*Frank Sherwin*

A trypanosome (genus *Trypanosoma*) is a parasitic flagellated protozoan that infects the blood, esophagus and colon of all vertebrate classes, and intestinal cells in invertebrates. Chagas disease (American trypanosomiasis), found mainly in South America, is a sometimes deadly parasitic condition caused by *Trypanosoma cruzi*. It is spread mostly by the triatomine (or kissing) bug of the subfamily Triatominae (figure 1), which feeds mostly on the person's face. The insect takes a blood meal from a vertebrate's host and, as it does, it sheds the infective stage of the parasite onto the host's skin where it can enter the body via the mucous membrane of the eye and bite wounds on the skin. Once in the host the parasites undergo various changes.

Two strains develop: the myotropic strain, which forms pseudocysts in muscle cells, and the reticulotropic strain in white blood cells. Unique trypomastigote forms of the parasite circulate in the blood and are eventually ingested by another kissing bug and the cycle between bug and human (or animal) continues. Alternate hosts or wildlife reservoirs that can carry this parasite in the United States include opossums, squirrels, armadillos, woodrats, and raccoons.

Endemic areas are South American countries, affecting around 8 million people with an annual rate of 561,000. Non-endemic countries (e.g. the United States) have about 350,000 infected individuals. The worldwide cost of treating this disease is estimated at $7 billion.

## Unique biochemistry and life cycle

Trypanosomes have the uncanny ability to coat themselves with a protein covering that makes them quite invisible to the vertebrate immune system and is the reason why it is so difficult to find a cure for *T. cruzi* infections (as well as African trypanosomiasis, or sleeping sickness). In addition, when they ensconce themselves inside a vertebrate cell, the trypanosomes have a biochemical ability to override the cell's self-destruct mechanism (via an enzyme called Akt), which would otherwise kill the cell and its deadly foreign cargo. This cell-destructive capacity was originally for regulatory purposes and was a microbe interface system design feature.

Like harmful mutations, creationists in general feel parasitism is part of the Curse, in Genesis 3. Indeed, according to evolutionists, parasitic behaviour, "[is] still an enigma".[1]

Complex life cycles of parasites are common. Within these cycles can be found incredible morphological and biochemical transformations. For example, the blood flukes (Digeneans, class Trematoda) have a stage called the cercaria. It is a small, heart-shaped larval phase that undergoes locomotion for about a day in freshwater, seeking a bird or mammal host. The cercaria originates from a structure called the daughter sporocyst within a snail (e.g. *Biomphalaria*). When the cercaria contacts the skin of a host it wiggles vigorously as it sheds its forked tail. After it enters the host's peripheral circulation it is called a schistosomule. The change this tiny entity undergoes is nothing short of amazing. It initially lived in a cold-blooded invertebrate with the ability to evade its immune system; then it enters a cool, freshwater environment. From there it enters a warm-blooded host with a more sophisticated immune system. The number of changes it must immediately undergo in order to survive each new environment is astounding. How could such a series of rapid biochemical changes evolve? It is no wonder an evolutionist stated:

> "It would be difficult, if not impossible, to explain, step by step, the details of the process of evolution by which some of the highly specialized parasites reached their present condition."[2]

Things have not changed in the 21st century:

> "Hence, tempo and mode of host-parasite co-evolution at the macro-evolutionary scale remains a major challenge to understand."[3]

image: Glenn Seplak via Flickr

**Figure 1.** The blood-sucking 'kissing bug', the agent of dispersal of a disease infecting millions

## Trypanosome origin

What was the origin of this parasitic trypanosome? What is required for a creature to transition to a parasitic lifestyle from a free-living condition is the loss or modification of anatomical and physiological systems. Poulin has stated that in some metazoan groups "parasitic species have retained some morphological resemblance with their free-living counterparts."[4] For example, *T. cruzi* is much like *T. rangeli*, which is not known to be disease-causing in people. *T. rangeli* often coexists with *T. cruzi*. It is common in people, cats, and dogs in South America and is found in triatomine bugs. Is it possible that at one time *T. cruzi* was also a non-pathogen that, through some genetic changes, became the scourge of the Americas? Could the protein coating be a way trypanosome and host could have existed together before the Fall?

In Genesis, when God cursed the earth with weeds and thorns, some non-parasitic protozoa may have lost the ability to live free in the environment and adopted a metazoan host for part—or all—of its life cycle. Perhaps, before the Fall, plant-feeding triatomine bugs had beneficial protozoa such as trypanosomes in their gut. Indeed, some species of trypanosomes are monoxenous, meaning they are found within one arthropod host. There is an intriguing genus of slender, long trypanosome (*Leptomonas*) with a free flagellum (a microscopic whip-like structure). It lives in the hindgut and is unique because the insect is the sole host. The trypanosome living in a mutualistic association within the arthropod host before the Fall would have required a (designed) microbe interface system. The insect and the trypanosome are autonomous entities that are harmonized by this interface arrangement. So, too, humans have associated with microbes (e.g. in their gut) since creation, so this microbial interface system is a design certainty.[5] This would answer the difficult question as to the function of the immune system before the Fall. Creation scientists are increasingly looking at this pre-Fall immune system in light of a dynamic host system-to-microbe relationship understood in light of design analysis. Perhaps an understanding of our immune system would be different with a fresh look via design analysis coupled with the work of creationist Joe Francis' enhanced, co-operative conception of our microbiota.[6]

## Mycetomes and triatomines

Some blood-feeding insects have specialized structures, called 'mycetomes', that carry endosymbiotic micro-organisms, which, in turn, provide nutrients to the insect. Triatominae and Cimicidae have a partial nutritional dependence on these micro-organisms. Cimicids have two disc-shaped mycetomes beside the gonads, while bloodsucking reduviids have epithelial cells in their gut containing these bacteria. There is good evidence that the triatomine bacteria are crucial for maturation and growth of the insects. Work can be done by creation microbiologists to determine possible links between these endosymbiotic micro-organisms, trypanosomes, and pathogenicity of Chagas disease.

All species of the triatomines are potential vectors of the Chagas disease parasite. Hemiptera generally feed on plant sap, and before the Fall all Hemiptera fed on plants (which are not 'alive' in the biblical sense). Perhaps, as mentioned above, the trypanosomes had a mutualistic relationship with the Hemiptera, much like the many hundreds of species of termites that have mutualistic protozoa (e.g. *Monocercomonas*). After the Fall, the transition was made from plants to people and animals. But how many steps would it take for free-living animals to become parasitic? Although it is true that some life cycles are complex (see reference 2), others may be virtually a one-step process, depending on the animal.

> "In fact, free-living species could become parasitic without substantial anatomical or physiological changes."[7]

Furthermore, it is intriguing that secular biologists, using evidence from molecules, estimate people may have been suffering from Chagas' disease for at least 4,000 years – which is within the biblical timeframe.[8]

## Conclusion

*Trypanosoma cruzi* is the scourge of South America with a unique biochemistry and evasion that makes cure and control of this protozoan parasite difficult. Secular biologists are unsure as to the origin of parasites whereas creation scientists see parasites as a result of the curse, possibly a transition from a mutualistic to a parasitic existence.

Many questions remain to be answered regarding this devastating parasite. Creation scientists continue to research it and other parasitic diseases from a non-Darwinian perspective.

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# Much supposed geological time missing from strata

*Michael J. Oard*

For many years, Ager pointed out that there was an enormous amount of time missing from the strata relative to the long geological time assigned to the strata by geological dating methods.[1,2] In other words, there are many more gaps than record. Sadler agrees that the time gaps in the rocks are ubiquitous.[3] Interestingly, in spite of all these apparent gaps, Ager admitted the sedimentation appears to be continuous:

> "… we cannot escape the conclusion that sedimentation was at times very rapid indeed and that at other times there were long breaks in sedimentation, though it looks both uniform and continuous."[4]

Roth has demonstrated the continuous nature of sedimentary layers by showing there is little or no erosion between layers, which he calls 'flat gaps'.[5] There should be physical evidence of extreme erosion, if these time gaps were real. The contact in figure 1 supposedly represents a gap of 160 Ma, yet shows little physical erosion of the flat gap between the underlying Cambrian Muav Limestone and the overlying Mississippian Redwall Limestone in the Grand Canyon.

Their belief in actualism forces geologists to see sedimentation as an ongoing process, depending on the environment, yet the rocks have another message. But most ignore the flat gaps in the strata and assume the strata are continuous over time. A few recognize the problem:

> "The implication of these concepts is that the stratigraphic record is highly fragmentary, consisting of 'frozen accidents' (in the phrase of Bailey and Smith, 2010). Most studies that attempt to extract rates and scales of processes largely ignore this important point, treating sedimentary successions, apart from the obvious breaks such as sequence boundaries, as if they represent continuous sedimentation."[6]

When the huge gaps in their alleged time are recognized, geologists ignore their significance. Three geologists writing about the continuous 600-m-thick sequence of sedimentary rocks in the southern Teton Mountains, north-west Wyoming, USA, stated:

> "The regularity and parallelism of the layers in well-exposed sections suggest that all these rocks were deposited in a single uninterrupted sequence."[7]

But do they believe their observations? No, instead they spread what looks like continuous deposition from one event into a 200 Ma sequence by inserting many flat gaps, one of which is 80 Ma in duration.

## Missing time in the Mesaverde Group, Utah, USA

A recent paper emphasized the pervasiveness of similar gaps by analyzing the missing time in the Mesaverde Group, Book Cliffs, Utah, USA.[8] Previous researchers have ignored the missing time in the Mesaverde Group: "However, the issue of fragmentary preservation of the record has not been discussed."[9] Miall shows that only little of the time attributed to the deposition of the Mesaverde Group is represented by rocks. The gaps represent anywhere from 10,000 to 1 Ma of missing time from a sequence that supposedly

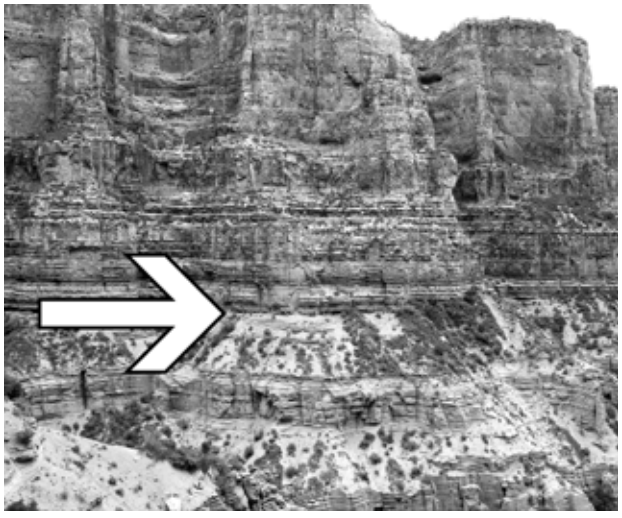

**Figure 1.** The Muav Redwall contact (arrow) shows little if any physical evidence for erosion, despite 160 Ma of missing geological time.

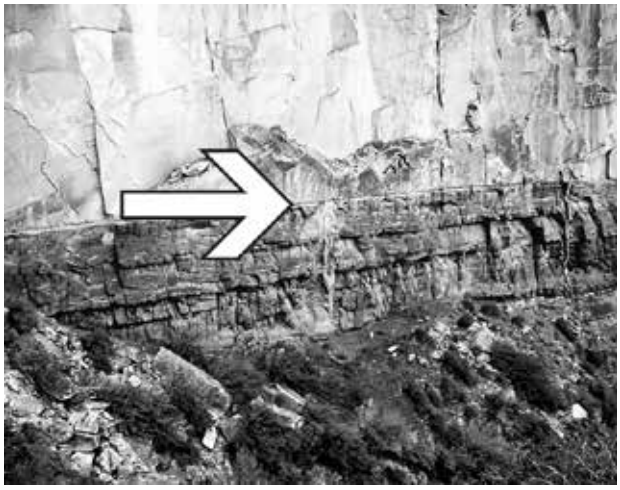

**Figure 2.** Flat contact (arrow) between the underlying Hermit Shale and overlying Coconino Sandstone in the Grand Canyon where supposedly 5–10 Ma of time is missing.

covers a period of almost 5 Ma. Most significantly, there is little physical evidence for the supposed missing time, just as Roth has pointed out. Such a gap has simply been labelled a paraconformity by geologists. A good example of a paraconformity is the 5–10 Ma of missing time at the flat contact between the Hermit Shale and the Coconino Sandstone in the Grand Canyon (figure 2).

Miall further notes these obscure gaps are typical of strata worldwide and that sedimentation provides a record of only 10% of the time, while 90% is not represented by any strata at all. A recent monograph has also emphasized that the time, required by their philosophy, really is missing.[10] Reed has also documented the missing time and has pointed out that geologists are finally becoming aware of this as a significant problem for their uniformitarian interpretation of stratigraphy.[11–14]

### Strata defy uniformitarianism

Miall has also pointed out a fact that many others have noticed: modern day sedimentation rates are much higher than rates inferred by the assumed multi-million-year ages of the strata:

> "This is not a trivial issue. The principle of uniformitarianism holds that processes observed in modern environments and interpreted from the ancient record should operate over the same range of rates. If such rates are measured in modern settings (floodplains, deltas, shoreface settings, etc.) over time periods of years to decades, sedimentation rates are up to five orders of magnitude more rapid than those that may be extracted from a typical geological succession … ."[15]

Reed and I have verified this contrast between modern rates of erosion and sedimentation versus those sedimentation rates inferred from the strata.[16]

### Conclusion

Uniformitarian geologists largely ignore the obvious implications of the missing time to their geological belief system, for instance the missing time in the Teton Mountain strata. Continuous sedimentation implies a 'single uninterrupted sequence'. Lack of erosion within and between layers of strata is confirming evidence that the sequence is uninterrupted. This is exactly the sort of evidence we would expect from Noah's Flood and further implies that the claimed millions of years are imaginary. The blindness of uniformitarian scientists to the significance of missing layers and lack of erosion cautions us. Be aware that important data may be ignored by secular geologists when the data do not support their belief in uniformitarianism and millions of years.

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# Erratum

*J. Creation* **30**(2)

The images for figures 8 and 9 on p. 118 should be swapped.

# The Lyman-α forest and distances to quasars

*John G. Hartnett*

Halton Arp's hypothesis, that quasars and active galactic nuclei (AGNs[1]) have a very large intrinsic component to their redshifts, which is unrelated to their cosmic distance from Earth, is strongly rejected by the Standard Model (big bang) community. It is claimed, that the many lines of the Lyman alpha forest in the spectrum of most quasars prove that they are very far away. Also, it is claimed that *increasing* Lyman-α (alpha) forest lines are connected with *increased* values of redshift, so supporting large distances. Is that observational true?

The argument for the Lyman-α (alpha) forest of spectral lines comes with several unprovable assumptions. It is assumed that there exist clouds of hydrogen gas between distant quasars and Earth that absorb ultraviolet light at the wavelength of the Lyman-α line of hydrogen, which is about 122 nm. Quasars also emit light in a strong Lyman-α emission line. The idea is illustrated in figure 1. The hydrogen gas clouds may be the surrounds of galaxies in the intervening space.

In the Standard Model a Hubble-law-like relationship is derived from the cosmology for all redshifts, resulting from cosmological expansion of the universe. Hydrogen clouds are assumed to absorb light from the assumed background quasars, and thus it follows that in an expanding universe all hydrogen clouds have smaller redshifts than any chosen background quasar since the hydrogen clouds are not as distant. As a result the absorption lines are all on the blue or shorter wavelength side of the quasar emission line, as shown in figure 1.

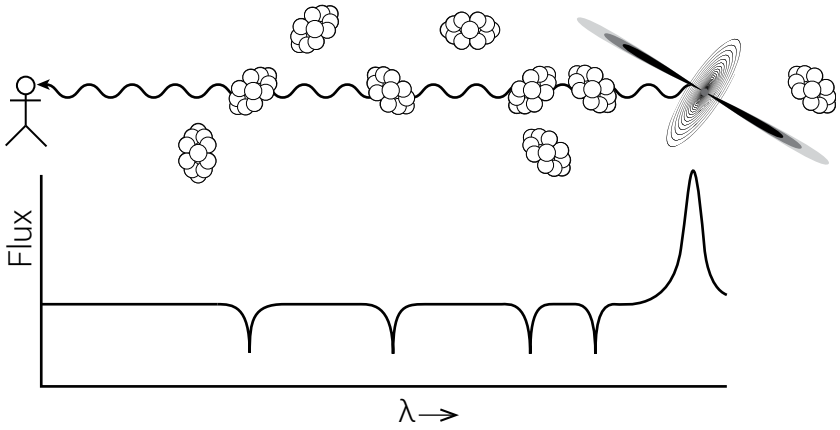


**Figure 1.** Graphic illustration of alleged hydrogen clouds in the foreground of a quasar. The bottom axis is the wavelength of the quasar light as seen in an optical spectrum (from Wright, ref. 3).

Figure 1 shows a quasar with its Lyman-α emission line (peak) redshifted from the ultraviolet emission to a wavelength in the red end of the optical spectrum when received at the observer. Four Lyman-α absorption lines (dips) from four intervening clouds, which the light intersects on its journey to Earth, as the universe expands, are shown to the left of the emission line. This illustrates the redshift of those clouds at different stages of the alleged expansion history of the universe and therefore by the Hubble law at distances proportional to their redshifts. In figure 1, the same Lyman-α absorption line is seen at higher and higher redshifts, due to the expansion of the universe, while the emission line of the quasar is seen in the red region of the spectrum instead of in the ultraviolet region where it would be for an un-redshifted spectrum.

Figure 2 shows two actual quasar spectra.[2] The top one is from the nearby quasar 3C 273, the first historically to be detected, with a

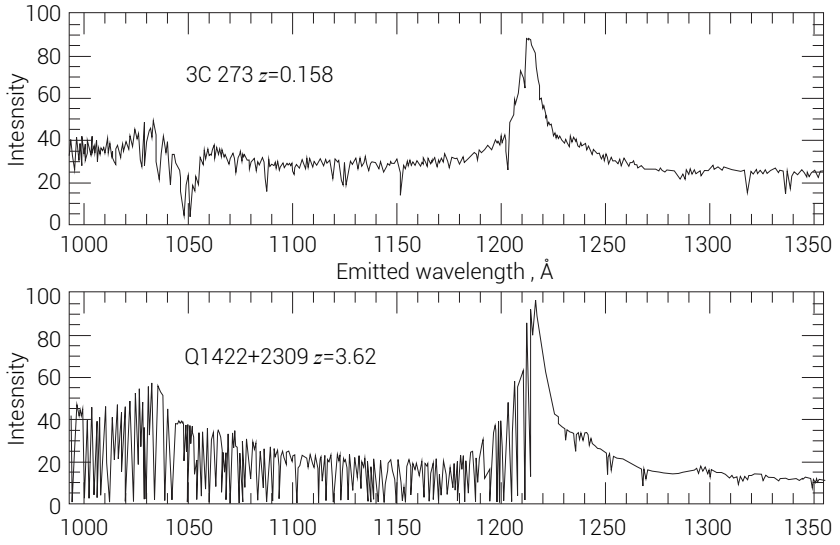


**Figure 2.** Two quasar spectra. The top one from a quasar with a redshift of z = 0.158 and the bottom one with a redshift of z = 3.62, shifted to a common scale in emitted wavelength. (After ref. 2.)

relatively small redshift (z = 0.158), and the bottom one is from a large redshift (z = 3.62) quasar Q1422+2309. The higher redshift spectrum (bottom panel) is shifted so that the emission line matches the lower redshift spectrum.

> "The 3C 273 data are the average of two pre-refurbishment exposures totalling 49 minutes with HST's Faint-Object Spectrograph. The spectacular data for 1422+2309 come from 7-hour Keck I HIRES spectrum at resolution of 6.6 km/s, which comprised 94,000 spectral pixels in the original data provided by Mike Rauch. The data have been averaged down to more closely match the 3C 273 results, and make the graph a little more legible."[2]

If the hydrogen gas clouds that result in these absorption lines are much more numerous at high redshifts it would mean you should get a high density of many absorption lines. Thus this is called a forest and the bottom panel of figure. 2 is said to illustrate this 'fact'.

It has then been argued that the increasing trend of more absorption lines at greater redshift indicates more hydrogen clouds between source and observer, and this then is evidence that quasar redshifts are due to cosmological expansion. One astronomer, who argues against Arp's intrinsic redshifts for quasars, writes:

> "We know that there are a small number of very big clumps of hydrogen in the distant Universe: the galaxies. We also know that smaller galaxies, the dwarf galaxies, are very much more common. Most of the clouds in the Lyman alpha forest are much less massive than dwarf galaxies and these small clouds are much more numerous. We can only see these very low mass clouds by the absorption they produce in the strongest line of the most abundant element: Lyman alpha. Thus by studying the Lyman alpha forest we can learn about the density fluctuations in the Universe on the smallest observable scales."[3]

But there seems to be some circularity in this argument. *The forest is evidence for the existence of the many hydrogen clouds, but astronomers only 'detect' the existence of these clouds from the host of absorption lines in the forest.* How do we know there are many small clouds between the quasars and the observer? The answer is *the forest of absorption lines*. Thus it follows that now we know the absorption lines indicate the existence of the hydrogen clouds, it is expected that they would generate many absorption lines at their respective redshift distances. The astronomer argues against Arp's hypothesis as follows:

> "Note that if Arp were correct and quasars had a redshift much larger than the redshift due to their distance, then there should be a gap on the blue side of the Lyman alpha emission line before the absorption lines began. Such gaps are not seen. So if Arp were correct the Lyman alpha forest would have to be an intrinsic property of the quasar, which would be a very unlikely situation. Distant galaxies are seen which also show the Lyman alpha forest, so we know that the intervening clouds do exist. For Arp to be correct the intrinsic absorption lines would have to act exactly like the intervening clouds would act under the standard hypothesis that the quasar redshift is entirely cosmological."[3]

## Arp's intrinsic redshift hypothesis

Arp and other astronomers proposed that quasars have an intrinsic component to their redshifts and thus those redshifts are not largely due to the expansion of the universe. Arp and others admit the possibility of a Hubble-law-like distance relationship for normal undisturbed galaxies but in the quasars and AGNs there is a strong intrinsic component. This has come about from their detection of quasar-galaxy associations.[4] They found examples of where galaxies appeared to have quasars physically associated with them, even a quasar in the foreground of a low redshift galaxy.[5] Arp proposed the ejection of quasars from the core of AGNs and as a result quasar redshifts are often found in pairs (with redshift values approximately the same) around a putative parent galaxy. Also it has been found that the quasar redshifts preferably are found at certain discrete values (0.062, 0.30, 0.60, 0.96, 1.41, 1.96, 2.64, …) named after Karlsson.[6] In respect to a collection of quasars which Arp and his colleagues examined he wrote:

> "For multiple quasars near galaxies we found that the predicted periodicities [discrete Karlsson redshift values] were fit by the formula at the 94% confidence level. If we made the small correction for the redshift of the parent galaxy, the confidence level increased to 95%. If we omitted one of the 14 groups which was discordant, the confidence level rose to 99.5%. But in establishing the reality of the periodicity the results are overwhelming. ... the confidence is 99.997% or only one chance in about 33,000 of being accidental."[7]

Some lines of quasars are found with the same redshift at a big bang epoch where such structures should not exist.[8]

But the Lyman-α forest may be a property of the quasars, and if so, it does not follow that it indicates a distance increase with an increase in density of absorption lines. This is discussed in a 2012 paper by Chris Fulton and Halton Arp, published in

the leading astrophysics journal the *Astrophysical Journal*:[9]

> "The standard model posits that the Lyα Forest is generated en route as radiation from a quasar passes through intervening galaxies leading to absorption at redshifts lower than the emission redshift of the quasar. The test of the theory comes from the redshifts distributed en route, which should match the distribution of intervening structures.
>
> "On the other hand, the intrinsic redshift [Arp's] hypothesis posits that the Lyα Forest comes from absorption in the quasar itself, presenting the question of how the forest arises. The variable mass hypothesis (Narlikar & Das 1980) would predict lower particle masses at younger age and therefore higher redshifts. If one is arguing for periodic (quantized) redshifts, then one would expect that after transforming to the rest frame of the host galaxy redshifts that the absorption line redshifts should show up at Karlsson values. This idea can be tested with the large databases available now, such as our investigation of the 2dF data.
>
> "One then argues that a galaxy has multiple creation epochs and when light from a created quasar comes to the observer, it passes through clouds of matter created earlier than the quasar, so as to have lower redshift than the quasar, thus producing absorption redshifts. So, one testable prediction that can distinguish the Standard Model from our hypothesis is the distribution of absorption features in the Lyα Forest. In contrast to the Standard Model, our hypothesis predicts that absorption features will be distributed at Karlsson values. We propose that detailed observations and investigations could be made of the galaxy–quasar systems identified by our detection algorithm, using quasars at higher redshift that display the Lyα Forest, to ascertain if the redshifts of quasar absorption features are consistent with Karlsson redshifts, thus categorically distinguishing our hypothesis from the Standard Model."

It would seem that Arp's hypothesis is not ruled out by the Lyman-α forest observations in quasar spectra. I am not saying that the Standard Model hypothesis for the Lyman-α forest is unreasonable, but that it is not the only possible explanation.

In fact, the same old problem pops up again—that is, how do you know anything in the cosmos when you have no direct access to the cosmos as one might have in a laboratory experiment? There are potentially multiple mechanisms that might result in the same observations and how do you exclude all except the one that you decide is the correct one? In the case of the Standard Model of the big bang origin of the universe, it is now assumed to be true and all observations are now fitted into that belief system. That type of thinking has led to many ludicrous conclusions especially many dark fudge factors.[10]

## Conclusion

When other evidence is considered (ejection of quasars from AGNs, quantized intrinsic redshifts, etc.) besides the Lyman-α forest of absorption lines there is evidence that contradicts the notion that the forest lines indicate the standard '*the greater the redshift the greater the distance*' rule in the cosmos. If that rule—known as the Hubble law at small redshifts—is not correct for quasars and AGNs then it undermines the fundamental foundation of the Standard Model of big bang cosmology—the expansion of the universe. And if there was no expansion there was no big bang!

The Bible says: "In the beginning God [not the big bang] created the [universe]" (Genesis 1:1).

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# Lichenometry may be pseudo-science

*Michael J. Oard*

Lichenometry is defined as: "Measurement of the diameter of lichens [figures 1 and 2] growing on exposed rock surfaces as a method of dating geomorphic features."[1] The date of the exposed surface is usually determined by measuring the diameter of the largest lichen on the surface and comparing it to its rate of growth. Despite potential pitfalls in the method, the maximum age limit is claimed to be about 10,000 years but is supposedly most accurate for younger surfaces.[2] Lichenometry can provide dates for glacial deposits, paleofloods, rockfalls, faults, talus, and other such youthful features. It is a common dating technique with 30,600 results from a 2012 Google search:

> "Since its conception by Beschel (1950) the measurement and interpretation of lichen sizes have become a very common technique with which to determine the ages of deposits, most commonly moraines and bodies of colluvium."[3]

## Numerous problems

In a devastating critique of the method, Osborn *et al.* pointed out numerous problems that occur with its application, which apparently are mostly ignored:

> "… neither authors/editors nor readers ask or seek answers to basic questions arising from the method. … Despite the many published doubts, use of lichenometry continues, apparently oblivious to criticism. Its popularity stems no doubt from *apparent* ease of application and general lack of expense. The result is a plethora of ages of glacial advances and landslides that may not have any basis in reality [emphasis in original]."[4]

They group the problems into (1) lack of agreement on procedures, (2) untenable assumptions, and (3) lack of experimental verification.[5] Regarding the lack of agreement on lichenometric procedures, there is no accepted standard on the time range of validity, which lichens are to be measured, the number of lichens sampled, the appropriate search area, data handling, and the treatment of error.

Regarding untenable assumptions, the assumption that the largest lichen colonized the rock and continued to grow at a steady rate has not been verified. Growth curves are deduced from areas far from the research location. The ecology of lichens is not very well known, and the correct identification of a particular species in the field can be difficult.

Regarding a lack of experimental verification, different researchers come up with widely varying results using the same method in the same area. Dates on surfaces of 'known age' are claimed to be incorrect. For instance, a lichenometry age on a moraine in the Sierra Nevada Mountains, California, USA, gave ages of 2,000–3,000 years.[6] These ages were rejected because it was claimed the deposits were 10,000 years older and from the last glaciation. Therefore, they claim without evidence that a late Holocene climate change killed the lichens, which then started growing again 2,000–3,000 years ago. It appears that preconceived ideas from uniformitarian glacial chronology determined the dates, and not lichenometry. This is circular reasoning. There is a lot of evidence to suggest that circular thinking is all too common when it comes to the Ice Age and even the rocks and fossils.[7]

## Method unreliable

Osborn *et al.* conclude that the method is unreliable, even suggesting it may be pseudo-science.[2] There is no way to tell a good date from a bad

**Figure 1.** The map lichen (*Rhizocarpon geographicum*), the lichen most used in lichenometry

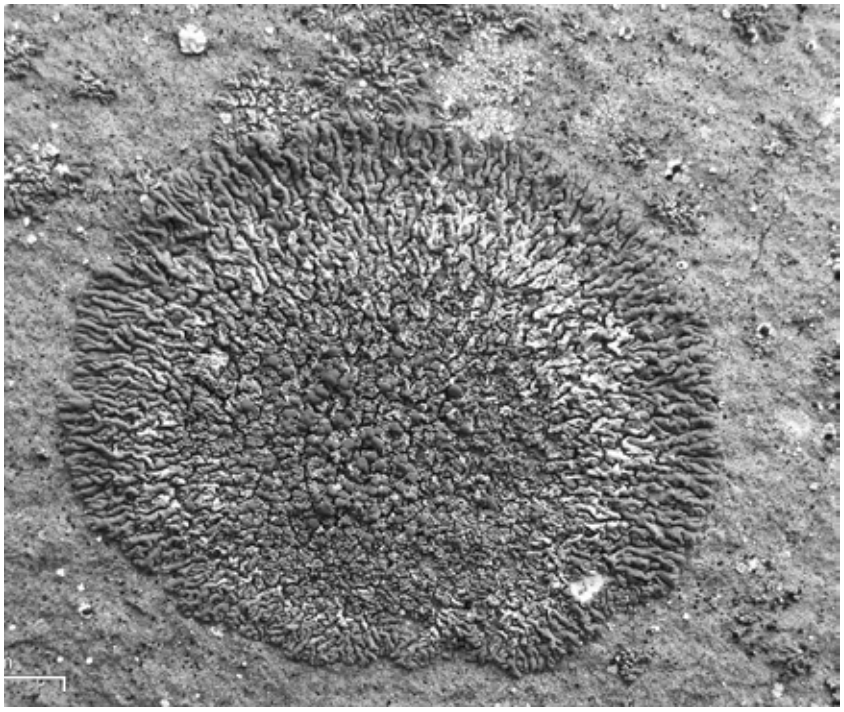

**Figure 2.** *Xanthoria elegans* was one of the first lichens used for lichenometry.

date, except by applying preconceived ideas: "But it cannot be foretold which lichen assemblages will provide good ages and which bad ages."[3] And of course there is the tendency to accept lichenometry dates, if they agree with preconceived ideas:

> "It would seem that subjectivity, opinion, and accuracy that is only nominal are acceptable so long as the resulting lichenometric ages seem reasonable."[8]

The conclusion is that lichenometry dates are likely useless: "It is not clear at this time whether lichen measurements will ever be able to provide reasonable numerical ages of geological substrates."[8]

Other scholars are taking note of the problems in lichenometric dating. Kaufman *et al.* warn that many Holocene glacial moraines have been dated by lichenometry, but these dates must be applied with caution because of the new results by Osborn *et al.*[9] The new results have made others who use lichenometry to be more cautious.[10,11] Some researchers claim that the method works best for younger ages, and in dating rock glaciers. Rosenwinkel *et al.* state:

> "We conclude that lichenometry works better as a tool for establishing a relative, rather than an absolute, chronology of rock-glacier lobes in the northern Tien Shan."[12]

The new result by Osborn *et al.* has caused some researchers to question previous results even for very recent debris flows.[13]

## Wider implications

Although lichenometry is restricted to ages of less than 10,000 years, the study has implications for dating methods in general. If the situation with lichenometry is any indication, it appears that researchers do not question the assumptions behind a particular dating method. Nor do they investigate the problems associated with it. Apparently, they are satisfied to accept the results when they agree with their predetermined expectations. If the dates don't agree, they will find an arbitrary excuse for why the 'wrong dates' are to be rejected.[14] In this way preconceived ideas are simply reinforced and given an impression of precision and accuracy. This reinforcement syndrome is a common problem in historical science.[15] Lichenometry provides one more example of why we should not be enamoured by the 'results' of secular research that supports the evolutionary, deep time worldview.

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# The Manx comet and naturalistic assumptions

*Wayne Spencer*

An object described variously as a 'rocky comet' or a 'Manx' comet was recently reported by an international team of researchers working under the PANSTARRS program.[1,2] The 'Manx' term describes it as being like a cat without a tail. The object has been given a comet designation of C/2014 S3 ('S3' for short). Object S3 was observed at a distance of 2.1 AU (astronomical units) from the Sun on 22 September 2014. It is a rather unusual object in that it has an orbit like a long period comet but the spectra of the dust emitted by it is very much like an S-type asteroid, making it of a silicate composition. Thus it raises the question of what the significance of a rocky object in an orbit like a long period comet is.

Scientists are suggesting that if more objects similar to S3 are observed, it could help confirm the new solar system origins theories that are being debated today by planetary scientists. Object C/2014 S3 orbits the Sun in a retrograde direction, with an orbital inclination of 169.3°.[1] Its eccentricity is 0.977,[1] making the orbit much more elliptical than that of an asteroid. Its perihelion (minimum distance from the Sun) is 2.049 AU and its aphelion (maximum distance from the Sun) is estimated at 178.9 AU.[1] This makes its orbit very much like a number of long-period comets. The S3 object has an orbital period of 860.3 years.[1] The discoverers of S3 are arguing that it must be an object that was 'stored' in the Oort cloud for most of the age of the solar system and was deflected inward relatively recently. So this is essentially an evolutionary way of saying that S3 is a young object, because of the nature of the dust it gives off. Yet to solar system scientists it is assumed to be a very old and 'unprocessed' object.

Today it is normally possible from the spectra to distinguish between an S-type asteroid, an icy comet generating a comet tail, and an extinct comet that can no longer create a tail. Scientists may take this discovery as tending to confirm some of the newer models on the formation of our solar system. The traditional nebula model for the formation of our solar system has no planet migration. But newer models, such as the Nice model[3–5] and the Grand Tack model,[6,7] suggest that Jupiter, Saturn, Uranus, and Neptune migrated in the early solar system. In these new models, the movement of Jupiter and Saturn would cause many planetesimals and small objects to be deflected outward. These new models for the formation of our solar system would say there could be some rocky objects in the Oort cloud, but the traditional nebula model would say that is unlikely.

Comets and asteroids are believed to have formed in the early solar system when many planetesimals were present. Accepted theories on our solar system posit that comets formed mainly in the outer planets region (from Jupiter to Neptune).[8,9] Asteroids formed mainly in the region between Mars and Jupiter, where temperatures were higher. Some of the small objects deflected outward would have enough velocity imparted by Jupiter and Saturn to allow them to escape the Sun's gravity. A small percentage of them could have enough energy to take them to distances of a few tens of thousands of AU and yet remain in elliptical orbits. These would become Oort cloud objects. At the aphelion of their orbit these objects move slowly and thus they could be 'captured' by the Oort cloud and are thought by many to remain stable there for possibly millions or billions of years.

In the modern understanding of the Oort theory, there are multiple regions that transition into the Oort cloud. From about the orbit of Neptune to a distance of approximately 55 AU is the region known as the Edgeworth-Kuiper Belt. Then from about 55 AU to perhaps 200 AU is a region called the Scattered Disk. The region from about 3,000 AU to roughly 20,000 AU is usually called the Inner Oort cloud. The Scattered Disk and Inner Oort cloud are thought to have objects with orbits that have a range of inclinations. Objects have been actually observed in the Kuiper Belt region and a few have been observed that would have orbits taking them into the Scattered Disk region. The inner part of the Scattered Disk represents the edge of what can possibly be observed with present technology. However, fewer objects have been observed in the Kuiper Belt and Scattered Disk than accepted models suggest.[8,10]

A comet is generally defined as being an object that can generate a comet tail. But the distinction between comets and asteroids is not always so clear. Asteroids can emit a dust tail and can give off water. Comets may have two types of tails, an ion tail and a dust tail. But comets tend to give off much more material in their dust tails than asteroids. The observations of C/2014 S3 indicate it has a very limited dust tail that is like an S-type asteroid; it is much less active in its 'tail' than a typical comet.[1] The near-infrared spectrum is used for these observations. There have been other 'tailless comets' but the unique thing about C/2014 S3 is that its spectrum is like an S-type asteroid. The paper by Meech *et al.* (2016), which reported the discovery of C/2014 S3, states that the first 'nearly inactive' object observed in a long-period comet orbit was 1996 PW. Meech *et al.* goes on to compare these two objects:

> "An exploration of the dynamical history of 1996 PW … showed that it was equally probable that

**Figure 1.** This comet is designated 2011 L4, also known as comet PANSTARRS. The PANSTARRS comet is named after the research project which discovered it. PANSTARRS is an acronym for 'Panoramic Survey Telescope and Rapid Response System'. The PANSTARRS telescope sits on top of the Haleakala volcano in Hawaii. The PANSTARRS system does optical astrometry and photometry using a 1.4 Gigapixel array of CCD cameras. It is used to detect many faint objects, including Near Earth Objects, asteroids, comets, and Kuiper Belt Objects. PANSTARRS was used to detect the C/2014 S3 comet.

> 1996 PW was an extinct comet or an asteroid ejected into the Oort cloud during the early evolution of the solar system. More recently, other Manx candidates have been discovered. We have observed five of them, which also show comet-like red colors similar to 1996 PW. C/2014 S3 is the first and only Manx candidate to date with an S-type reflectivity spectrum."[1]

Young-age creationists have argued for a young solar system from the lifetimes of short-period comets.[8,11–13] Today there are generally considered to be two classes of short-period comets, the Jupiter Family Comets (JFCs), and the Halley Type Comets (HTCs). The JFC comets have orbits of low inclination and they are believed to come from Kuiper Belt objects, the orbits of which have been altered by Jupiter. The Halley Type Comets on the other hand have a broad range of orbit inclinations and they have somewhat larger orbits than the JFC objects. Halley Type Comets are sometimes in retrograde orbits as well. Today comet researchers believe the HTC objects come from the Scattered Disk, but demonstrating the orbital dynamics of this has not been entirely successful.[14] There are fewer HTC objects than models have predicted. One paper estimated what it called the 'death-rate' of HTC comets as being 69,000 years.[14] This is the time for them to become essentially unobservable. The Jupiter Family Comets would have shorter lifetimes (or 'death-rates') than this. So the young-age argument for short-period comets is still valid. The young-age argument creationists have made from short-period comets I believe applies mainly to the Jupiter Family Comets. But object C/2014 S3 is not a short-period comet.

How then should young-age creationists understand long-period comets? Comets in orbits with orbital periods greater than 200 years are considered to be 'long-period' comets. There is a wide range of orbital periods for the long-period comets, from 200 years up into the millions of years. But the orbital period of a long-period comet orbit has nothing to do with the age of a comet or the age of the solar system. As mentioned above, Jupiter Family Comets could be Kuiper Belt objects, the orbits of which have been altered by Jupiter. But Halley Type Comets and long-period comets could have been created mostly in their present orbits. Thus, in a young-age perspective, there is no need to invent a place like the Oort cloud to 'store' comets for billions of years. For many long-period comets with orbital periods in the hundreds of thousands to millions of years, they would only traverse a small part of their orbit in 6,000 years. Many of the long-period comets are still on their very first trip toward the Sun. This is actually something astronomers would agree on, even if they believe in an old solar system. There is debate among comet researchers on the question of how many of the long-period comets are 'new' and have not yet ever reached their perihelion.

An object like C/2014 S3 could only have made about 7 orbits in 6,000 years. It is very plausible that a rocky object could still be giving off some dust after such a timeframe. Other long-period comets observed may have a more significant tail than S3, but they could be young for the same reasons. Some comets disrupt completely when they pass near the Sun. But scientists have estimated that more typically comets can make anywhere from a few dozen to hundreds of perihelion passes before they are 'extinct'. Thus, in a young-age point of view, there is no need for an object like S3 to be 'stored' for billions of years in a hypothetical cloud (the Oort cloud) that cannot be observed.

## Conclusion

Solar system scientists often try to classify objects and define them according to their origin. Yet no human being was able to observe the origin of our solar system or the objects in it. There is a great tendency for scientists to only view new discoveries through a lens that is built up from many naturalistic assumptions. But naturalistic assumptions are often inadequate in matters of origins. The S3 object seems to be a comet of an unusual composition. The assumption that all comets are 'dirty snowballs' is probably worth questioning. It may be that we need a classification system

for the composition of comets. Such a system has not been devised to my knowledge. As Bible believers we can build our thinking on different assumptions than secular science and sometimes come to better answers.

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# The Great American Biotic Interchange pushed back over 10 million years

*Michael J. Oard*

Evolutionary scientists have dated many events within their timescale. They have determined absolute dates for the extinction of the dinosaurs, the crossing of many animals both ways across the Bering Land Bridge, and the mammal migrations known as the Great American Biotic Interchange (GABI).[1] These dates are considered firm and commonly represent 'tie points' for correlation with other data sets. For instance, Ice Age deposits are often tied to what are considered well-dated events of the Pleistocene, such as the start of the Holocene about 10,000 years ago and the start of the last Ice Age about 120,000 years ago within the uniformitarian Ice Age scheme.

## The Great American Biotic Interchange

The GABI is an important evolutionary event in that it supposedly determines part of the order of fossils found in the Americas and whether a fossil animal either migrated or evolved. Secular scientists believe the GABI happened when land and freshwater fauna migrated from North America via Central America to South America and vice versa, as the Isthmus of Panama rose to produce a land bridge. The land fauna that migrated included several different large groups, including mammals, reptiles, amphibians, arthropods, and flightless birds. Secular scientists claim this event occurred in the late Cenozoic or late Neogene (Pliocene), 'dated' 3 Ma ago. The GABI includes the invasion of South America by horses, camels, and saber-toothed cats from North America. At the same time, armadillos, glyptodonts (figure 1), and ground sloths spread northward into North America. Many of these animals are extinct, but some are common in Ice Age deposits.

Two absolute time tie points associated with the GABI are the beginning of the Ice Age cycle and the closing of the seaway through Panama between the Atlantic and the Pacific Oceans that supposedly initiated several paleoceanographic changes. Some climatologists believe that it was the closing of the seaway that initiated the Ice Age cycle, but other climatologists consider this to be unlikely.[2]

There have always been exceptions to the giant exchange at 3 Ma ago, possibly because uniformitarian fossil and radiometric dates were encountered that were older than 3 Ma. For instance, the gomphothere proboscidean is one of those animals that supposedly migrated to South America during the GABI, but an earlier date was suggested because of the finding of a gomphothere in South America in the late Miocene, 9.5 Ma ago:[3]

> "It is generally believed that they [gomphotheres] extended their range into South America during the late Pliocene and early Pleistocene as part of the Great American Biotic Interchange (McKeena and Bell, 1997; Mothé *et al.*, 2012), although there is some suggestion that they dispersed into South America during the late Miocene (Campbell *et al.*, 2000)."[4]

As suggested by the example of the gomphothere, several interchanges are believed to have occurred well *before* 3 Ma ago, before there was a supposed land bridge connection.[5]

These exceptions have been called 'heralds', and this term seems to be an attempt to sweep away the difficulty with crossing an ocean between North and South America. Scientists theorize that the heralds must have moved across Central America by 'island hopping' or some other mechanism, and not by direct land bridges.[6–8]

Because of the complexity involved in uniformitarian dating methods, it was discovered that there was not one massive interchange at 3 Ma ago, but that there were periods of enhanced mammal migration at four different times younger than 3 Ma ago. Therefore, some scientists postulate four separate GABIs.[6] There were also periods with little interchange, even when a land bridge was thought to be in existence, which seems paradoxical. All these GABIs and heralds are based on assumed 'precise dates', although the fossil record of South America is still not well understood.[9]

## GABI now thought to have been 13–15 Ma ago

The 'firm date' for the GABI has recently been challenged. New evidence claims that the GABI started 13–15 Ma ago, instead of 3 Ma ago.[10,11] The evidence comes from U-Pb dating of zircon crystals in basins and rivers of the northern Andes and from examining the location from where the zircons could have originated. Some of these zircons are claimed to be uniquely from Panama. This would suggest zircons were transported by a river connection across the Panama land bridge 13–15 Ma ago. These new results are also used to explain the earlier herald migrations.[12] Since the main animal migrations did not start for another 10 Ma, at the start of the GABI, it raises the question of why the massive migrations did not happen sooner: "But why did many organisms wait until migrating around 3 million years ago?"[13]

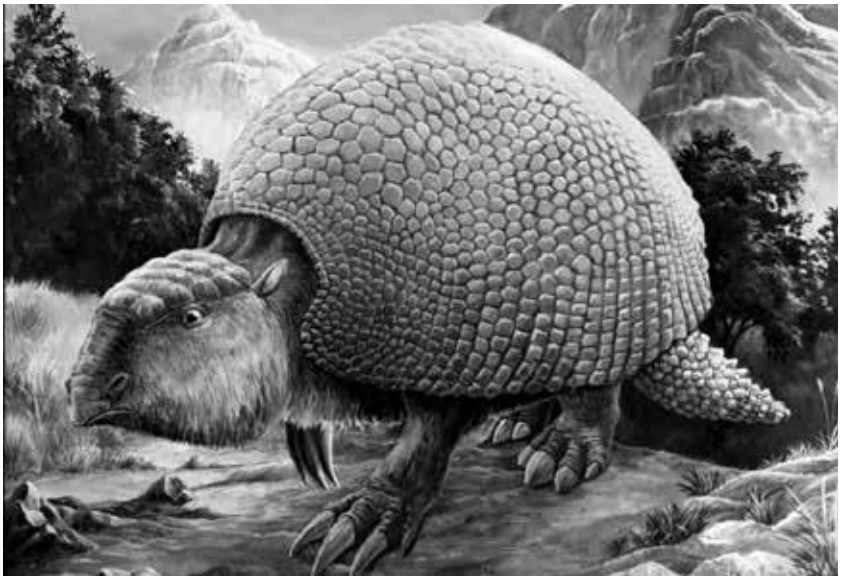

**Figure 1.** An artist's conception of a glyptodont, which weighed up to 2,000 kg

Since a presumed 'factual' tie point has been challenged, some scientists dispute the new results. Some scientists suggest that the zircon crystals could have originated from somewhere other than Panama, or that the connection was not complete between the Americas until 3 Ma ago with a seaway farther north than Panama.[2]

## Creation science implications

The new results show how some seemingly well-supported evolutionary events can be derailed by new evidence. When the dates of tie points change, the chronology of other data sets is also affected. It is hard to know how the change in dates of the GABI, if accepted, will shake up the uniformitarian scenarios of evolution and migration. The controversy over this date is at least showing how arbitrary this tie point is and how delicate is uniformitarian chronology.

It is best that creation scientists not take these 'events' or 'tie points' seriously even in a relative timescale. It also illustrates the many excuses given for exceptions, such as the claim for 'heralds' or 'multiple GABIs'.

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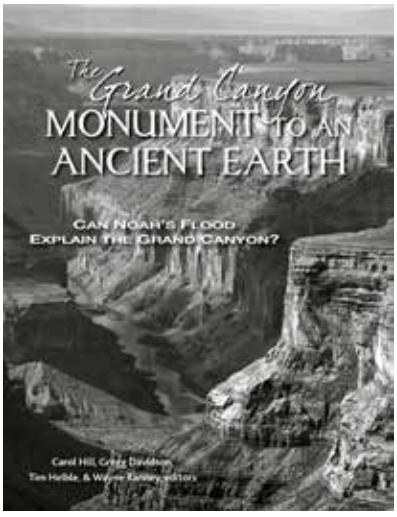
# The Grand Canyon in the thralls of shallow, doctrinaire uniformitarianism

***The Grand Canyon: Monument to an Ancient Earth***

*Carol Hill, Gregg Davidson, Tim Helble, and Wayne Ranney (Eds.)*

Kregel Publications, Grand Rapids, MI, 2016




*John Woodmorappe*

The Grand Canyon, located in the southwestern US, is one of the most beautiful geologic sites on Earth (figure 1).

I began this well-illustrated and much-hyped book expecting to be stimulated and challenged. Instead, I must confess a certain annoyance with its extraordinary superficiality. I invite the reader to compare this book with *The Genesis Flood* [1] and *Grand Canyon: Monument to Catastrophe*.[2] Most, if not all, of the arguments dusted off in this book have long been answered in these classics. And the rest are answered in more recent creationist works. Towards the latter part of this review, I examine some other geologic topics, but need to strongly stress the fact that it would require a full-length book to address all the fallacies of this pro-uniformitarian compromising evangelical missive.

The 'usual suspects' are behind this book, as is obvious in the Acknowledgments (p. 5). These include Davis Young, the so-called American Scientific Affiliation, the John Templeton Foundation, and the BioLogos Foundation.

This work is an anthology, with articles written by different authors. When I use the phrase 'the authors' in my review, I am referring to the authors of the specific article in the book.

## Really nothing new

The authors repeat the argument that Flood geology is largely a 20th-century invention (pp. 23–24). In actuality, it strongly goes back to the very start of the science of geology, as even a cursory examination of the historical evidence makes clear.[3]

The reasoning in this book is nothing more than the same old, same old shibboleths of compromising evangelical thinking:

- because the majority of scientists believe something, it therefore must be true
- the Bible is not a book of factual information (science), only of spiritual truths, and the two can conveniently be dichotomized
- Bible interpretations on scientific matters were sometimes wrong in the past (e.g. Galileo), so therefore all scientifically relevant ones are also, and
- the Flood cannot be universal because universal terms are sometimes used in a non-universal sense, and more.

We hear the old chestnut that there was no petroleum-based pitch, before the Flood, to seal the Ark. The authors insist that it had to be petroleum, and not tree-derived tar, but do not convincingly explain why this is supposed to be so. After all, pitch has historically been made by boiling pine resin with charcoal.[4] Let us, however, for the sake of the argument, suppose that they are correct. A recent review article on the subject of petroleum origins retains the possibility that some (though not most) petroleum may be of inorganic mantle origin.[5] For that reason alone, it is possible that some petroleum existed before the Flood.

The reader hears, once again, that is impossible for both freshwater- and saltwater-organisms to have simultaneously survived a global Flood. That challenge was met a long time ago.[6]

We are told, once again, that the Hebrew word *eretz* (supposedly) does not refer to planet Earth; it only refers to 'local region', 'soil', and the like. (p. 26). This would mean that God created the soil of the Middle East, if nothing more, a few thousand years ago—which itself is not in agreement with the 'settled science' of standard geology. Moreover, if *eretz* merely refers to the 'known world' of the Bible authors, it means that the Noachian Deluge covered, at minimum, the territory between the Nile River and the Persian Gulf. This is as much in conflict with uniformitarian geology as is the global Flood! Such is the *reductio ad absurdum* of compromising evangelical thinking.

But wait, it gets even better. In the concluding chapter of the book, the

**Figure 1.** The Grand Canyon, one of the most photographed, picturesque sites on Earth

authors (p. 209) actually cite Psalm 104:5 as something that would nullify Galileo's thinking (but not Psalm 16:8, which uses the same Hebrew word for 'moved'), and then conclude that we should all search for the truth. Is the informed reader supposed to laugh, or what?

### When scientists disagree

The authors have a tendency to reckon the positions of some creationists as if they held for creationism in general. The authors bring up catastrophic plate tectonics and the insuperable heat problem—disregarding the fact that not all creationist geologists accept catastrophic plate tectonics—in part for this very reason.

On a separate issue, the authors seem to be obsessed with the idea of Earth-circling giant tsunamis, evidently not realizing that some Flood geologists (myself included) prefer to think in terms of regional tectonically driven movements of floodwater. (It should be added that 'continent-sized sheet sandstones' need not imply singular depositional events. Local and regional sandstones can overlap in shingle fashion, creating the illusion of a single, massive sheet sandstone—even within the context of standard geology.[7])

The authors (pp. 176–177) strongly object to Flood geologists pointing to the fundamental disagreements between evolutionists as evidence of the weakness of the evolutionary-uniformitarian position by bringing up the considerable disagreements between Flood geologists. This fallacious argument treats the two positions as being on a par. They are not. There are only a handful of active Flood geologists in existence against thousands of uniformitarian geologists, and so the research capabilities of the former are very much smaller than those of the latter. For this reason alone, disagreements, especially over fundamental issues, are a much, much more serious problem for uniformitarian geology than they are for Diluvialist geology.

This is not to say that all disagreements among creationists are of an innocent, developmental nature. For instance, the infighting among creationist geologists as to which fossiliferous strata is pre-Flood, Flood, and post-Flood, over which some of the authors gloat (p. 33, 177, 212), only illustrates the pitfalls of the uniformitarian concessions that are behind the non-recognition of the Flood as the cause of much of the Phanerozoic sedimentary record. Taken to its logical conclusion, this neo-Cuvierism leads to the vanishing Flood. Not surprisingly, neo-Cuvierism is commonly a way station between Flood geology and the abandonment of the Flood in favour of the complete package of uniformitarian geology.

### The straitjacket of uniformitarianism

The principle of uniformitarianism asserts the temporal continuity of the regularities of nature ('natural laws'), the configurations of geologic actions (e.g. rivers, deltas), and the overall rates of geologic processes. The authors would have us believe that Flood geologists themselves use uniformitarianism when they compare Mt St Helens with the Grand Canyon. This is very much mistaken. Using present-day geologic processes in order to decipher the past is not, in and of itself, uniformitarianism. It is common sense. It only becomes uniformitarianism when it becomes an all-encompassing ideology that shackles the geologist's thinking into a Huttonian-style steady-state mentality of Earth history, and causes him to disregard or explain away the plain teachings of Scripture about the earth's past.

Let us make the foregoing clear. Consider the well-worn dictum, 'The present is the key to the past.' To paraphrase, 'the present is *one* of the keys to the past', but 'the present is not the *only* key to the past'. *That* is the essential difference between the Flood geologist and the uniformitarian-serving compromising evangelical geologist.

Furthermore, the uniformitarianism employed by the compromising evangelical geologists of this volume is not merely a mental box, it is a

straitjacket. The comments of some of the authors (p. 65) are not only revealing, they are glaring. They write:

> "The sedimentary layers found in the Grand Canyon can be easily explained by a succession of rising and falling sea levels. No fantastic or undiscovered natural processes need be invoked to account for what is observed."

In other words, if present-day geological processes (supposedly) account for the Grand Canyon strata, there is nothing else to even consider! The author's one-track adherence to doctrinaire uniformitarianism is positively lock-step in character.

The authors (p. 65) continue:

> "The flood geology model, on the other hand, requires many fantastic or never-before-seen explanations, including sediments accumulating at phenomenally high rates … . It's remarkable that such speculations are even necessary, given the total absence of any descriptions of global tsunamis, catastrophic continental upheavals, massive gravity flows, or violations of natural laws in the Genesis account of Noah's flood."

Am I reading a 21st-century compromising evangelical geologist, or am I reading Hutton and Lyell, or some other 18th- or 19th-century rationalist?

The authors' understanding of Scripture *itself* is woeful. Why should the Bible have to mention *every single* detail of what happened during the Flood? In addition, the obtuseness of the authors' reasoning about the Flood is something to behold. How could a global Flood, by its very nature, *not* produce 'never before seen' phenomena? How could a global Flood *not* include large currents, catastrophic continental upheavals, etc.? Are we effectively hearing the old 'tranquil Flood' nonsense once again—which would be as miraculous as a tranquil explosion? How could a miracle-working God (in whom, by the way, compromising evangelicals profess to believe) *not* sometimes induce 'violations of natural laws' (or more properly, *additions* to natural laws), and otherwise circumvent the 'principle of least astonishment'?

What's more, the quoted 'principle of least astonishment' is a repackaging of the ideas of the atheist philosopher David Hume. This rationalist said that any miracle, by its very nature, is so fantastic that the 'principle of least astonishment', which dictates that whoever reports it, no matter how credibly, either must be mistaken or untruthful, has to be applied. If the compromising evangelical authors of this book were to actually apply uniformitarianism and its 'principle of least astonishment' consistently, they would have to reject the bodily Resurrection of Jesus Christ. After all, scientists know of no process that can make an unambiguously dead organism resurrect, and no trained biologist has ever observed an unambiguously dead organism come back to life.

## Transported nautiloids and other body (and trace) fossils

Extensive suites of aligned nautiloid fossils have been found, in the Grand Canyon, indicative of current transport (figure 2). Faced with this evidence, the authors point to all those Grand Canyon fossils which lack preferred orientation, and tell the reader that this means that there were no currents when they were being deposited. This is a *non sequitur*. To begin with, it is naïve to suppose that currents must have *constantly* been in operation during Flood-related deposition. Obviously, a slackening of the current would have caused the organisms to be deposited without a preferred orientation. However, let us, for the sake of argument, assume that currents *were* constantly in action. In this case, preferred orientation is proof of current transport, but a *lack* of preferred orientation is *not* proof for the absence of current transport. In fact, organisms, notably those having long axes, are commonly interfered with by entrained sand grains, or readily interfere with each other during current transport, and thus end up deposited in a non-preferred orientation.[8]

Now consider those body fossils that are (or appear to be) 'in place'. They are so few and far between, in relation to the numbers of fossils obviously not in place, that they can largely, if not entirely, be explained as fortuitous depositional events.[9]

Predictably, the authors bring up the order of fossils in the fossil record as incompatible with the Flood, and uncritically cite simplistic anticreationist papers that are caricatures of the scientific creationist position on this subject. They also overlook my TAB (Tectonically-Associated Biological Provinces) model, which adds to previous creationist models, and which especially explains why today's flora and fauna have little in common with that of the early Phanerozoic fossil record.[10]

**Figure 2.** Nautiloids showing preferred orientation in the Grand Canyon

The authors clumsily try to deny the circular reasoning behind using fossils to date rocks. No matter; it is undeniable. For instance, certain strata are redated as Cambrian (and not Pre-Cambrian) upon the discovery of a trilobite, and then the circle of reasoning closes when the insistence is made that said trilobites are limited to the Cambrian.[11]

Let us now move this discussion from body fossils to trace fossils. We once again hear about vertebrate footprints as an insuperable problem for the Flood. They are not. The authors conveniently ignore the many creationist studies on this subject. The matter is elementary; minor changes in elevation can successively expose, bury, and re-expose large areas of land undergoing flooding, and a single medium- to large-size land vertebrate can make 10,000 footprints in one day.[12]

An analogous chain of reasoning holds for the construction of trace fossils, by marine organisms, at the sediment/water interface. Consider also the disruption of sediment by burrowing organisms. What if extensive bioturbation can simultaneously occur, at different tiers, within thick layers of deposited sediment?[13]

## Miscellaneous geologic interpretations hurled at the Flood

This book brings up a number of geologic features that—according to conventional geologic thinking—need long periods of time to develop—much longer than a year-long Flood. All such conclusions in this book involve subjective interpretations masquerading as facts, and all of them are completely steeped in uniformitarian reasoning. Moreover, most of them are based on superficial reasoning; furthermore with not so much as a glimmer of questioning of canned uniformitarian explanations.

The authors dust off the argument that the Flood cannot explain pure carbonate rocks, as its unavoidable turbulence would necessarily have mixed different types of sediment together. A little appreciation of scaling disposes of this trivial objection. A source area of pure carbonate mud may be 100 km x 100 km in area, while the depth of the Flood may be only 1 km. We thus have a plume of floodwater that is at least 100 km long, 100 km wide, and only 1 km deep. So long as the current flows in a linear course, it does not matter how turbulent the water is within it; only pure carbonate will be entrained in the plume (except perhaps at its boundaries), and so only pure carbonate mud will be deposited, over a large area, when the current slackens (again, except perhaps at its boundaries).

Pure carbonate rocks can also have formed, during the Flood, through primary processes. Note that the solubility of carbonate increases with pressure, while the solubility of most solids is essentially pressure-independent. Deep flood water might have selectively dissolved calcium carbonate; especially likely when the source as proposed is already enriched in carbonate. When the pressure is relieved as the water slackens and shallows, calcite can precipitate. Pressure-dependent solubility of carbonates explains why the oceans have a "calcite compensation depth", below which no calcite forms, although this ~ 4 km.

Now consider alleged paleokarst. So-called paleokarst has also been interpreted as the results of tectonically induced movement between layers of rock, which could happen if the breccias can be tectonic in origin without showing fault fabrics or evidence of deformation.[14] So-called paleokarst breccia can also be colluvial deposits.[15] Finally, the leading karstologist Dr Emil Silvestru argued, "All 'paleokarst' interpretations are to be treated with caution because true paleokarst is unlikely to have been preserved for the length of time implied."[16]

On a related subject, consider so-called paleosols. They, too, are subject to multiple interpretations.[17] In fact, Knauth warns that "Interpreting ancient depositional environments is a tricky business, and a stratigraphic layer without telltale root fossils may be a paleosol only in the eye of the beholder."[18] (However, even undisputed root traces are not evidence of paleosols, at least not necessarily. Roots can be allochthonic, as proved by indicators of current transport.[19]) On another matter, Callow[20] points out that so-called tubules, putatively caused by pedogenic bacteria, may actually have been caused by microbial mats, and warns that Miocene paleosols may be unsafe homologues, or even analogues, to their presumed counterparts under the inferred very different geologic conditions of the Proterozoic. (This, itself, is revealing. It shows the influences of uniformitarian thinking in the identifications of so-called paleosols.)

The authors trot out the old argument that mud cracks, in the fossil record, are conclusive evidence of long-duration subaerial exposure, and that they are distinguishable from syneresis cracks. They are not. Recent research confirms earlier studies that demonstrate that there is no clear-cut morphological distinction between subaerial desiccation cracks and syneresis (subaqueous shrinkage) cracks.[21] Furthermore, the geologist must rely on other evidences of subaerial exposure (e.g. raindrop prints) before concluding (actually, supposing) that said cracks are indeed desiccation cracks. This, of course, is tacit admission that such cracks cannot

stand alone as evidence of subaerial exposure. Finally, the divergent geologic thinker can contemplate a fortuitous co-occurrence of such cracks and things such as raindrop prints. And/or he can consider a chain of causality in which the same tectonic movement that caused a surface to emerge very briefly (and receive raindrops) also caused a chemical strain within the sediment that generated the adjacent and/or subjacent syneresis cracks.

Were Grand Canyon sediments soft when the strata were folded, and the Canyon itself eroded? The authors object to the evidences of soft-sediment folding and erosion of Grand Canyon sediments—based on the existence of fracturing, and on the absence of certain supposedly expected indicators of soft-sediment deformation and erosion. This is seriously wrong-headed, at multiple levels of reasoning. To begin with, brittle deformation, such as the existence of an extensive network of fractures, most definitely does occur in unlithified (semiconsolidated to consolidated) sediment.[22] Furthermore, fractures and faults are common in unconsolidated sediments.[23] In addition, there is often no sharp boundary between soft sediments and lithified rocks to begin with, and the nature of deformation (brittle or plastic) is partly governed by deformation velocity.[24] What's more, according to van Loon:

> "SSDS [soft-sediment deformation structures] may look surprisingly similar to deformations formed in hard rock … [and] It has now been recognized, for instance, that specific types of deformation are not restricted to hard rock or even to crystals, but can also occur in unconsolidated, even water-saturated deposits."[25]

What else have we overlooked?

Not surprisingly, the authors paint a self-congratulatory portrait of isotopic dating, and dismiss the difficulties as poor sample selection, contamination, etc. This borders on the farcical. In actuality, the entire field of isotopic dating is beset with a systematic parsing and manipulation of evidence.[26]

## Conclusions

Despite its lavish illustrations and photos, this book is little more than an uncritical rehash of the same set of old arguments that are imagined, by atheistic geologists, by compromising evangelical geologists, and by neo-Cuvierist geologists alike, to nullify Flood geology. They are, in the context of this book, nothing less than a monument to the virtual enslavement of compromising evangelicals to rigid uniformitarian ideology.

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# From creation to new creation

***From Creation to New Creation: Biblical Theology and Exegesis***

*Daniel M. Gurtner and Benjamin L. Gladd (Eds.)*

Hendrickson Publishers, Peabody, MA, 2013

*Lita Cosner*

On the occasion of a well-known scholar's 65th birthday or his retirement (or another significant occasion), some of his students and colleagues may come together to produce a *festschrift*, or a collection of essays in his honour in his area of specialization. Such essays typically interact with the work of the honouree.

*From Creation to New Creation* is a *festschrift* for G.K. Beale (b. 1949), edited by two scholars who studied under him. Beale is an ordained minister in the Orthodox Presbyterian Church and Professor of New Testament and Biblical Theology at Westminster Theological Seminary, and was previously at Wheaton College for 10 years. The breadth of subjects reflects the huge impact Beale has had on biblical studies over the course of his career. Several of the essays are especially relevant for review in *Journal of Creation*; some of which deal with passages directly relevant to creation apologetics, and others of which highlight apologetically useful exegesis. Because the scope of the book is such that space will not allow for a review of each essay, this review will focus on the following essays, which are of most relevance to readers of this journal.

## Eden: A temple? A reassessment of the biblical evidence

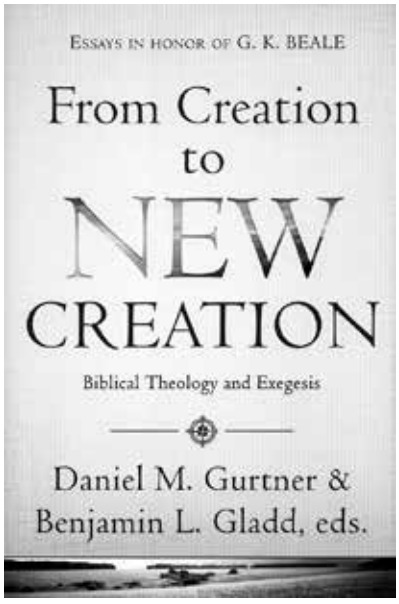
In Daniel I. Block's essay, he questions the common view that Eden was described in cultic terms that indicated a temple function. In fact:

> "Genesis 1–3 introduces readers to a world that could be considered sacred space by virtue of its divine origin but that the narrator fails (or refuses) explicitly to place in that category, either by using special priestly vocabulary or by means of a conceptual framework" (p. 5).

While there are obvious Edenic elements in the tabernacle and temple, Genesis does not characterize Eden itself as a temple (pp. 3–4). In fact, the temple itself is a solution to how God can interact with a fallen world, so there was no need for a temple in Eden, just as there is no need for a temple in the New Jerusalem.

It is exegetically significant whether Eden is being described in terms of the temple, or whether the temple contains elements looking back to Eden:

> "The question is, should we read Gen 1–3 in light of the later texts, or should we read later texts in light of these? ... By themselves and by this reading the accounts of Gn 1–3 offer no clues that a cosmic or Edenic temple might be involved. However, as noted above, the Edenic features of the tabernacle, the Jerusalem temple, and the temple envisioned by Ezekiel are obvious. Apparently their design and function intended to capture something of the original creation, perhaps even to represent in miniature the original environment in which human beings were placed. However, the fact that Israel's sanctuaries were Edenic does not make Eden into a sacred shrine" (p. 21).




Because John Walton's work attempting to show that Eden was depicted as a temple can undermine a historical interpretation of Genesis, this argument is useful for creation apologetics.

## The shape of the Torah as reflected in the Psalter, Book 1

C. Hassell Bullock argues that the languages and images of the Torah colour book 1 of the Psalms (Psalms 1–41). Levitical terms and Exodus references abound. Particularly relevant for the readers of this journal, Creation imagery is also abundant. As Bullock points out:

> "In Ps 19 David draws upon the imagery of creation and the gift of the Torah and reviews the power of sin. In the broad sweep, Ps 19 is a 'little Torah', beginning with creation and balancing that with God's gift of the law ('the Torah of the Lord' ), much like the Pentateuch in its broader scope. The poet does not make an effort to duplicate exact phrases from the creation account, but he shares

the vocabulary of Gn 1–3, much as Ps 27 employs the language of the conquest. In fact, while other terms are common Hebrew vocabulary, the word 'skies' ('firmament', עיקר, *rāqîaʿ*) is distinctive to the creation narrative, and the other occurrences in Ezekiel, Daniel, and the Psalms likely belong to that semantic center, suggesting that the Genesis narrative is the palette from which the psalmist takes his colors" (p. 44).

He concludes:

"The shift from the cosmos to humankind at 19:8[7] is no accident but represents the centering of the Genesis story on humanity, beginning with Gn 2, and the eventual redeeming factor of the Torah that is the major emphasis of the Pentateuch" (p. 45).

Furthermore, Psalm 33 brings together language and imagery from Creation as well as the parting of the Red Sea.

"By its combination of terms from the creation narrative (Gn 1) and the story of redemption from Egypt at the Red Sea (Ex 14, 15), the psalm brings together the theological notions of creation and redemption, implicitly linking the Lord's work of creation to the miracle of redemption. God is Redeemer precisely because he is Creator" (p. 48).

The entire essay is informative and well worth reading, but the comments about the use of creation imagery in the Psalms is especially useful.

## Narrative repetition in 1 Samuel 24 and 26: Saul's descent and David's ascent

A common argument that apologists must refute is that Scripture in certain cases is not historical, or a historical core has been embellished with non-historical elements. In John D. Currid's and L.K. Larson's chapter, they take on the assertion that 1 Samuel 24 and 26 are so similar that they must be two retellings of the same event. They look at the narrative's progression throughout the book to argue that the two accounts are different events, and the way they are portrayed reflects character development advancing the plot of Saul's fall from the throne and David's ascent.

"When all is said and done, it is difficult not to conclude that there is a purposeful compositional design of the two narratives. The character development of both Saul and David is clearly in evidence as the text moves along from 1 Sm 24 to 1 Sm 26. David becomes more honorable, bolder, generous, and God-fearing; Saul becomes less so" (p. 62).

## Samson and the harlot at Gaza (Judges 16:1–3)

Another common criticism of Scripture is that its heroes are often recorded engaged in acts of sin, opening them up to the charge of hypocrisy. While it is no surprise that every 'hero' of the Bible except Christ was sinful, Gordon P. Hugenberger defends Samson against a misinterpretation of his visit to the harlot at Gaza recorded in Judges 16. He points out many similarities between Samson's predicament and that of the Israelite spies going to Rahab's house in Joshua 2, and that Samson's intent to render the city defenceless (by carrying away the city gates) would have precluded his taking advantage of the more traditional hospitality of the town. There are purposeful parallels between Samson in Gaza and the spies in Jericho, and understanding this helps us to interpret the book of Judges more accurately.

## Genesis 1–3 and Paul's theology of Adam's dominion in Romans 5–6

Roy E. Ciampa argues that understanding Adam's reign and what that meant once he fell into sin is crucial for understanding Paul's gospel. In Romans 5,

"Paul has concluded either that humanity abdicated the throne and transferred its authority to a reign of sin and death or that humanity continues to reign but, having chosen the route of sin and death, can do no other than extend a reign marked by sin and death rather than the reign of righteousness and life intended by God" (p. 111).

This requires a historical reading of Genesis:

"Paul's reading of the early Genesis narratives reflects the relevance of his gospel message for the full depth of the problem of sin and death introduced by Adam and provides the foundation for the Christ-centered gospel of God's solution not just to the problem of human guilt requiring forgiveness and justification but also for the wider problems of human corruption requiring the overturning of all of Adam's corrupt reign and its replacement with the reign of righteousness intended by God from the beginning" (121).

## The temple, a Davidic Messiah, and a case of mistaken identity

Supposed errors in the New Testament's citation of Old Testament are often occasions for skeptics to charge Scripture with error, so Nicholas Perrin does Christian apologists a service in examining a supposed error when Jesus cites Abiathar, instead of his son Ahimelech (or Abimelech), in connection with David and his men eating the showbread (Mark 2:26; 1 Samuel 21:1–9). His case proceeds in an orderly, logical fashion. First, he

establishes that at the time of Jesus, Judaism "seems to have applied the term 'high priest' not only to the unique officeholder but also to certain individuals, whether male relatives or colleagues, who were closely associated with him" (p. 165). He points out that Annas and Caiaphas were both called the high priest at the same time. "By first-century usage, Abiathar truly was high priest during the event at Nob, and Mark is, technically speaking, quite correct despite the scholarly charge to the contrary" (p. 168).

So Jesus and Mark were *not* wrong to say that Abiathar was high priest during the incident in question. That leaves the question: why would Jesus reference Abiathar and not Abimelech? Perrin shows that throughout the Gospel, Jesus is not only presented as the Messiah, but as the rebuilder of the temple and the reformer of temple worship. Abiathar was the priest deposed by Solomon after he supported Adonijah's rebellion.

> "Employing Abiathar as an emblem of a rebellious and therefore failed priesthood, Mark's Jesus is in effect speaking a parable that draws upon a well-known story from history in order to explain the present. Drawing up lines of opposition between himself on the one side (represented by David) and the high priestly order on the other side (represented by Abiathar), Jesus anticipates the Solomonic enthronement of his final week (Mk 10:46–15:47)" (p. 175).

This convincing answer to "the Abiathar problem" has wider application, because it is an example where a more thorough knowledge of Jewish thinking of Jesus' day, and understanding what Mark's goal in writing his Gospel was, eliminate the problem entirely.

As Perrin says:

> "The history of modern biblical interpretation reminds us that, more often than we care to admit, biblical criticism identifies problems in the text that would not be problems were it not for our own mistaken assumptions" (p. 166).

## How do you read? God's faithful character as the primary lens for the New Testament use of Israel's Scriptures

The New Testament cites the Old Testament Scriptures in ways that can be difficult for modern Christians to understand or fully appreciate. Rikk E. Watts suggests:

> "For the NT authors, what God had done in Christ was necessarily entirely consistent with his previously revealed character as expressed throughout his ongoing dealings in word and deed with his people, the nations, and his creation at large. It is proposed that a citation of or an allusion to Israel's Scriptures is best understood as invoking some principle concerning God's character, and thus his intention, in a situation that is deemed similar to an earlier one or, given the significance of Jesus, the fulfillment of an earlier promise" (p. 202).

Both the OT and NT are concerned with revealing who God is and what He is like. The NT invokes the OT in many places to show that the way God speaks and acts in the New Covenant, particularly through the Person and ministry of Jesus Christ, is consistent with the way He spoke and acted in the OT.

## From Creation to New Creation: The biblical epic of king, human viceregency, and kingdom

Christopher A. Beetham presents an argument that the 66 books of the Bible tell an overarching story of Creation, Fall, Redemption, and Restoration.

> "Despite postmodern suspicion of metanarrative, Scripture narrates an ultimate epic that claims to make sense of all the smaller stories of the global community. Christian Scripture is the story of the Creator-King fulfilling his original creation intentions to establish the earth as the kingdom of God through flourishing human viceregency" (pp. 237–238).

This narrative works itself out through patterns of typology, especially focused on the descendants of Abraham and particularly the Davidic line. Of course, creation apologists would continue by saying that for the story to be a true revelation of God's character, it must be a *historical* story.

## A useful, wide-ranging survey

The purpose of the *festschrift* is to celebrate an author with essays dealing with areas in which the honouree has contributed. The book (as well as the several-page-long bibliography of Beale's published works) makes it clear that Beale's contribution has been wide-ranging indeed. And it is encouraging that in this work, several apologetically useful arguments are put forth.

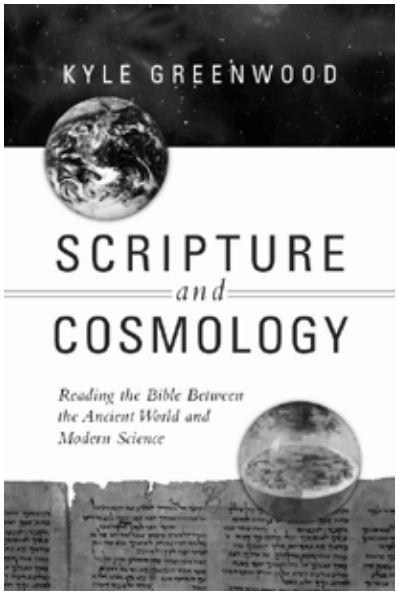
While written by and to specialists in biblical studies, this book is well within the reach of serious students of Scripture. And while not all of the articles are written by biblical creationists, compromising views of creation do not come through in such a way as to limit the usefulness of this excellent book.

# The cosmologist's gambit

***Scripture and Cosmology: Reading the Bible between the Ancient World and Modern Science***

*Kyle Greenwood*

IVP Academic, Downers Grove, IL, 2015




*James Patrick Holding*

Not quite twenty years ago, I wrote my first two articles for this ministry, on the subject of Paul Seely's professions that the Bible taught a flat earth, and a sky that was a solid dome.[1,2] Seely's primary argument in both cases amounted to this: all ancient people believed that the sky was solid and the earth was flat; therefore, the authors of the Bible must have believed this also; therefore, the Bible teaches a solid sky and a flat earth.

It is true that some things never change. Today we have something of an equivalent form of argument being presented in Kyle Greenwood's *Scripture and Cosmology*, though commendably without any of the overbearing tone of condescension that Seely offered. Greenwood's text is primarily a highly informative survey of ancient cosmological beliefs, and, to that extent, it can be taken as a valuable resource for the interested student. Greenwood also deserves commendation for ferreting out mythological additions to the roster of critical arguments, such as bogus quotations attributed to men like John Calvin, which allegedly align them with false cosmological beliefs (p. 173). However, Greenwood nevertheless preserves Seely's primary error, relying overmuch on the beliefs of others as a guide for what the Bible actually teaches, and not giving sufficient consideration to the meticulous contextual realities that dictated how the Bible reported its teachings.

## The equivocation resolution

The key to this particular issue for Christians is reconciling the premise of an omniscient God, who reputedly inspired the biblical text, with statements about matters like cosmology that are inferred and argued to be at odds with what is observed in the real world. My resolution of the matter was, and is, that God inspired the authors of the Bible to use *equivocal language* that accommodated any cosmological view a reader might have. As I said in my original response to Seely:

> "Rather than wave the white flag over inerrancy with this compromise over *raqiya'*, it is better served … to realize that the inspired author of Genesis was allowed to use the only terms available to him in his language to describe natural phenomena, but was *not* allowed to offer anything more than the vaguest, most minimal descriptions of those phenomena, thereby leaving nearly everything unsaid about their exact nature. Genesis 1 was perfectly designed to allow that interpretation which accorded with actual fact, for it 'says nothing more than that God created the sky or its constituent elements' while remaining '*completely silent*' about what those elements were. It only depended upon where one started: if one starts with the presumption of a solid sky, one will read into the text a solid sky. If one starts with a modern conception, the text, as we shall see, permits that as well …
>
> "The cosmology has been kept so basic and equivocal that one must force certain meanings into the text and analyze what the writer 'must have been thinking' (as well as pay no attention to the fact that God, not man, is the ultimate author of the text) in order to find error."

I developed this point further in a more recent article for the Christian Research Institute, where I specifically focused on the claim that the Bible taught a flat earth:

> "The Bible was written in a time and culture remote from ours, and biblical authors were limited in terms of what they could coherently express to their audience. This is not to say that God could not have inspired an author to reveal that the Earth was a sphere. However, although inspired by God, the biblical text had to offer an *accommodation to human finitude*.
>
> "To illustrate the problem, a critic once remarked that the parable of the mustard seed (Matt. 13:31–2) would have been more impressive had Jesus compared the kingdom of heaven to a redwood. Since no one in first-century Palestine knew what a redwood was, the critic argued, this would have demonstrated prophetic knowledge to the modern reader.

> "Such judgments reflect a provincialism that assumes the modern reader should be a privileged target of the text. If Jesus spoke of redwood trees, it would represent a stunning anachronism that readers for hundreds of years to come would find puzzling, and potentially consider a reason to reject the Bible's message, just as some claim to reject it today because of alleged flat-Earth passages. The modern critic demands accommodation from God at the cost of confusion for all who lived before.
>
> "… The most efficient option for the inspired text, therefore, was to make no explicit statements about subjects such as cosmology, which is exactly what we find in the Bible. It is also why critics can only make a case for a 'flat-Earth Bible' by inference."[3]

The element that both Seely and Greenwood miss is that if we believe the text is inspired, then God is the ultimate author of the text. To be sure, God used fallible brokers to put His ideas to paper. We may freely suppose that authors like Isaiah or Jeremiah may have *personally* held to any number of erroneous ideas about any number of things, including cosmology. However, in such circumstances, where a biblical prophet is inspired to transmit a message to a larger audience about a subject matter over which they are *personally* ill-informed, an equivocal expression of language is the proper and logical compromise for producing an inspired text. Neither Seely nor Greenwood accounts for the text as a divinely brokered product which compels this compromise.

### Yes, it is the context

Greenwood deserves praise for much of his message in this book, apart from the informative background information about the cosmological beliefs of biblical cultures. He attests that the Bible is a book of great depth and richness, one that the serious student can spend a lifetime studying and still only scratch the surface (pp. 10–11.). He also offers a refreshing tutorial on the necessity of applying contextual information to our biblical studies (pp. 18 ff.). As a Christian apologist, I have spent much of my career refuting the claims and arguments of atheists, cultists, and other misinterpreters who read the Bible as though it were written just yesterday, in modern English. Although the Bible can be understood to some extent by a surface reading, contextual study adds a layer of depth that deepens our understanding of the text, and helps prevent abuses. It can also handily refute critical claims by opponents of Christianity.[4]

It is also refreshing that Greenwood counsels readers to not assume that ancient people were childishly ignorant. For example, he explains that not even pagans thought of the storm god Baal in terms of being a "man-like creature poised to unleash his electric arsenal … . The authors of these texts were not myopic or dense in their understanding of the cosmos or the natural world" (p. 41). Critics of a particularly misotheistic persuasion are quite fond of supposing that the Bible depicts God in a similarly cartoonish fashion, as a white-haired and bearded old man with a foul temper.

Yet, in spite of these commendable lessons, Greenwood does not take this logic quite far enough. Let us grant that, for example, Jeremiah believed, as his contemporaries supposedly did, that the earth was a pancake-like surface with a solid dome over the top. This may well have been true, assuming that Jeremiah even had an interest in the subject. But if there is something to be said in an inspired text that touches on the subject, doesn't it stand to reason that God would have employed this method when using Jeremiah as a prophetic broker?

Greenwood gets very close to the answer with his discussions of God's willingness to accommodate a reading or listening audience. To a greater extent than Seely, Greenwood is willing to incorporate the logic of biblical contexts as a defining factor in how the Bible presents itself. He rightly notes, for example, that in missionary preaching the Apostle Paul adjusted his presentations to suit the "cultural peculiarities of his audience" (p. 197). So, for example, when he spoke to the Jews, Paul made extensive use of the Old Testament, but when he spoke to the Athenians, the Old Testament is barely visible, if it is visible at all. Especially when it came to the Gospel message, God was willing to contextualize His Word so that it could be more easily understood, while not being willing to compromise its power and truth. In contextualizing his message for groups like the Athenians, Paul struck the ideal balance between power and truth.

We ought to seek a similar solution for the matter of the Bible's transmission of cosmological truths. Greenwood seems to think that God's proper response would be to in some way inform Jeremiah so that his cosmology was up to 21st century standard. Indeed, Greenwood indicates as much when he comments on the text of Daniel 4:10–11. In this passage, the dream of Nebuchadnezzar is described as including a tall tree that can be seen "to the ends of the whole earth". It is natural to assume that Nebuchadnezzar's dream would reflect his own cosmological beliefs; or more precisely, that he would describe his dream in those terms. It is doubtful that, in his dream, Nebuchadnezzar actually walked to and fro to each end of the disc-shaped earth in order to be able to say that the tree was visible from all ends of it! Rather, he would have gauged the height of the tree and assumed its range of visibility.

Greenwood admits to this point, agreeing with the premise that "just

because the Bible describes various human perspectives, it does not mean that the divine Author endorses these positions" (p. 75). However, he then proceeds to suppose that Daniel would feel compelled to correct Nebuchadnezzar's cosmology (p. 76)! This is misguided for reasons already explained. Such knowledge would not only be useless to Nebuchadnezzar (as well as Daniel), it would also have served to invalidate Daniel's authority as a prophet in the eyes of his contemporaries.[5]

Unfortunately, Greenwood cannot see any middle ground between God allowing the authors of Scripture to promulgate outright cosmological error and God teaching the biblical authors all the correct details about cosmic geography. The balance, as noted, is between the power of God's Word and the truth of God's Word. Greenwood's solution weighs heavily on the side of truth, but in the process, it compromises on the matter of power. The middling ground of the authors expressing such matters using equivocal language offers a far better balance between the two.

## The earth treatment

Greenwood's treatment of biblical texts concerning the 'earth' aptly illustrates the problem. He does not even consider the option I developed in my prior articles, that 'earth' in the Old Testament usually did not mean planetary Earth (pp. 73–79). Instead, Greenwood immediately assumes that 'earth' refers to the whole planet, and from there, after the manner of Seely, proceeds to read error into the text.

In some cases the results of these forced readings are comical. Job 1:7 has Satan saying that he came to God after "going to and fro on the earth, and from walking up and down on it". Greenwood remarks that this presents "an earth that Satan can cover completely by foot …" (p. 74). How can it have escaped Greenwood that the text presents Satan as one who has clearly made his way *into Heaven* to speak to God, a journey that could hardly have been made on foot? Is the 'prince of the power of the air' grounded? In this case, it doesn't matter whether the author of Job thought the "earth" was a disc, a sphere, or a dodecahedron; Satan is presented as a supernatural being, and we can hardly imagine that he would be understood as standing at the shore of the sea thumbing for a ride

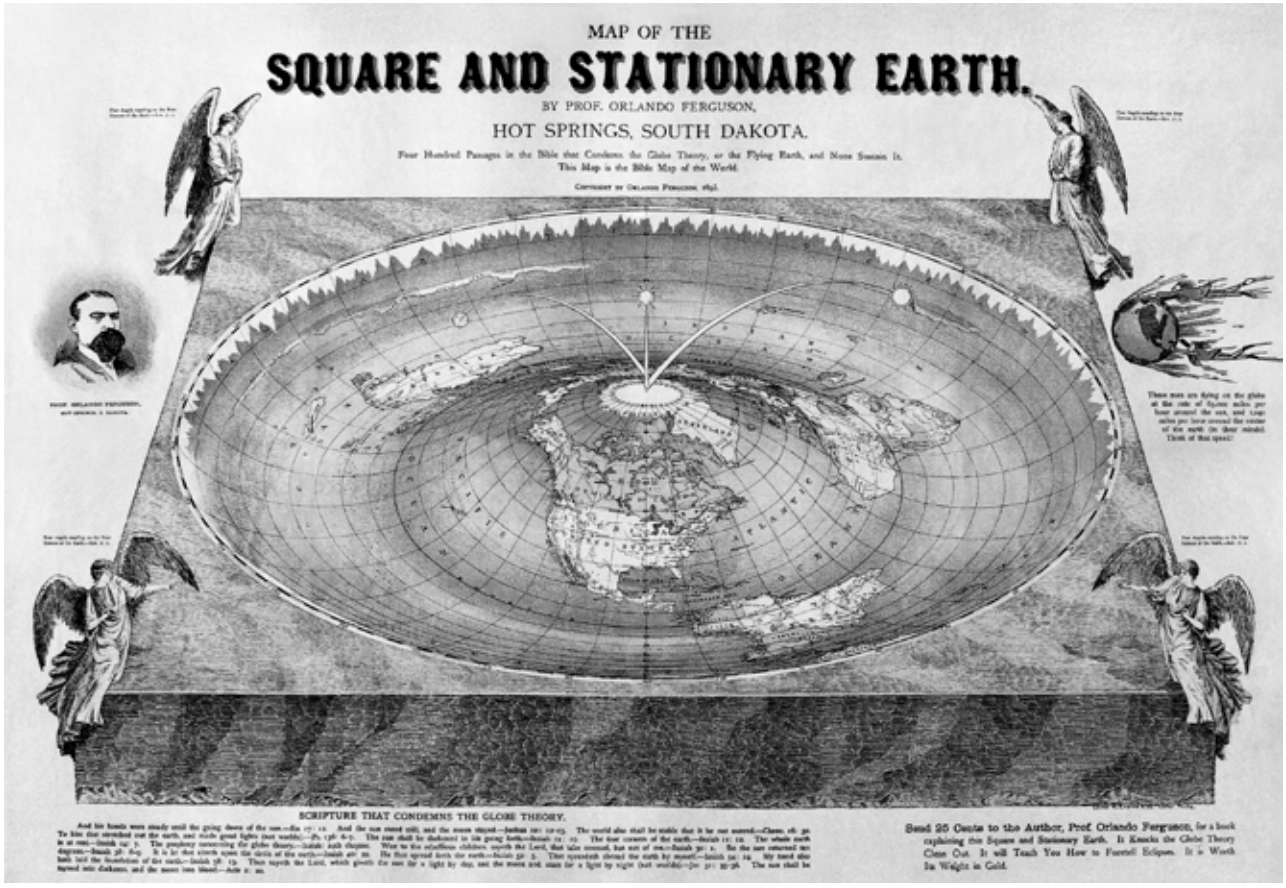



**Figure 1.** This 1893 rendition by Dr Orlando Ferguson was an attempt to reconcile Ferguson's reading of the biblical text with the cosmological observations of science.

across from the Ugaritic navy. Even if the author of Job did have planetary Earth in mind, Satan's hiking habits would say nothing whatsoever about the shape of the earth as a planet.

In most cases, however, Greenwood merely presents a biblical phrase (like 'ends of the earth'), assumes his reading of a planetary Earth, and leaves it at that. My past articles deal with the several examples presented by Greenwood, and though he presents the matter in a far less condescending fashion than Paul Seely, he argues in much the same way Seely did.

**Figure 2.** Some critics, as well as some biblical interpreters, say that biblical cosmology describes an earth that is flat, rather than a globe.

### Structure and narrative

Of particular interest to the creationist is Greenwood's treatment of the creation accounts of Genesis (pp. 106 ff.). Greenwood does well to present the formulaic structures present in the text. These are the devices typically used by a society in which some 99% of the population was unable to read: they enabled the hearer of the narrative to remember more easily what was said. But do these structures say anything about the text in terms of its historical value, or whether it was intended to be understood as historical? Probably not. As the expert in oral tradition Albert Lord once remarked:

> "Traditional narrators tend to tell what happened in terms of already existent patterns of story. Since the already existing patterns allow for many multiforms and are the result of oft repeated human experience, it is not difficult to adjust another special case to the flexibly interpreted story patterns. ... . The fact that the Entry (of Jesus) into Jerusalem, for example, fits an element of mythic pattern does not necessarily mean, however, that the event did not take place. On the contrary, I assume that it did take place, since I do not know otherwise, and that it was an incident that traditional narrators chose to include, partly at least because its essence had a counterpart in other stories and was similar to the essence of an element in an existing story pattern ... . That its essence was consonant with an elements in a traditional mythic (i.e., sacred) pattern adds a dimension of spiritual weight to the incident, but it does not deny (nor does it confirm, for that matter) the historicity of the incident."[6]

To be sure, there are certain degrees of accommodation to an oral society that we may hypothesize without compromising the integrity of the Biblical account. One might readily argue, for example, that the brief conversation recorded between Eve and the serpent (Genesis 3:2–5) served as a precis' for a longer and much more detailed exchange. But the question of historical accuracy, which is indirectly raised by Greenwood's material on Biblical genre, is not resolved by a mere appeal to genre.

In summary, Greenwood exceeds Seely in terms of his willingness to factor in divine accommodation of human finitude as a factor in the composition of the biblical text. For that, he may certainly be commended as having taken a step in the right direction, away from Seely's restricted viewpoint. He may also be commended for providing an accessible resource on ancient cosmological beliefs. When it comes to the question of whether the Bible allows for the fact that the earth is a sphere, though, perhaps it could be said that Greenwood has failed to bring the question of context to a *full-orbed* conclusion!

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2. Holding, J.P., Is the *'erets* (earth) flat? Equivocal language in the geography of Genesis 1 and the Old Testament: a response to Paul H. Seely, creation.com/ earth-flat.
3. Holding, J.P., The Legendary Flat-Earth Bible, equip.org/article/legendary-flat-earth-bible.
4. Perhaps my favourite example of this is an atheist who claimed that Deuteronomy 22:8 was ridiculous because it required houses to have barriers around their rooves to prevent people falling from them. The atheist assumed that in ancient Israel, like today, people seldom ventured onto the roof of a house. In reality, ancient peoples used their roof as an open-air room where various activities were performed. Falling from a roof was a real and recurring danger.
5. I am excluding from consideration here such arbitrary *deus ex machina* solutions as, for example, God could have caused the Holy Spirit to enlighten Nebuchadnezzar so that he came to believe in a spherical earth, and did not see that as compromising God's message. Though certainly possible in logical terms, it is clear that God seldom operates in such a compulsory way.
6. Lord, A., The Gospels as oral traditional literature; in: Walker, W.O. (Ed.), *The Relationships Among the Gospels: An Interdisciplinary Dialogue*, Trinity University Press, San Antonio, TX, p. 39, 1978.

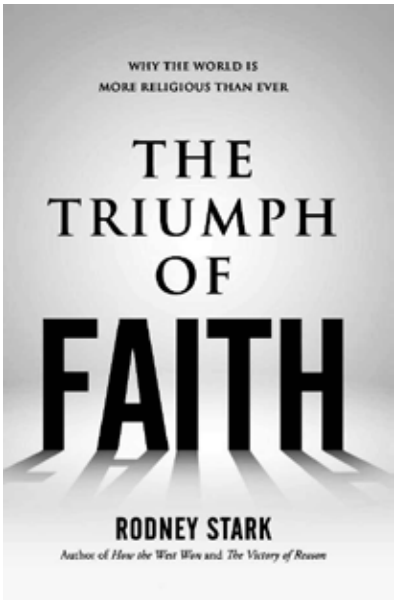
# Unmasking the myth of the impending death of religion

***The Triumph of Faith: Why the World is More Religious Than Ever***

*Rodney Stark*

ISI Books, DE, 2015

*John Woodmorappe*




Author Rodney Stark is Distinguished Professor of the Social Studies at Baylor University, where he is co-director of the Institute for Studies of Religion. He is also a Pulitzer Prize nominee and winner of three Distinguished Book Awards from the Society for the Scientific Study of Religion. He has a website that features his many books (rodneystark.com).

There has been a lot of 'received wisdom', in recent years, about religion in general and Christianity in particular. Much of this 'wisdom' is wrong, as shown by Stark throughout this book.

## A few caveats

Some of the figures in this book must be interpreted with caution. For instance, Stark quotes percentages reflecting the low rates of atheism in most nations. However, self-declarations of atheism are usually lower than simply being in a state of absence of belief in God. (Some atheists take this to absurd extremes, asserting that every child is born an atheist—until inculcated with belief in God.)

In addition, and as noted by the author, 'God' is subject to various self-concepts. Someone can, in good conscience, say they believe in God, but their idea of 'God' may be very much at variance with the biblical definition.

Stark cites rates of churchgoing that are much higher than those I have seen elsewhere. He tabulates data that indicates that, in the western European nations, at least 13% of the population went to church in the last week (p. 21). Other sources, however, indicate 2–5%.

The author seems not to consider the fact that self-reports of regular churchgoing sometimes tend to be higher than actual attendance rates. For instance, self-reports would imply that roughly 40% of the American population is in church on a given week, but actual counts of church attendance put the estimate closer to about 25% (which is still much higher than other industrialized nations).

Finally, the reader must remember that 'secularization' has multiple definitions, ones that are not brought out by Stark. For instance, a seminary professor from Great Britain once told me that he considered the USA more secular than England because, whereas individual religious observance is higher in the USA, there is more religion in public life in England than in the USA.

## Religion and morality

Liberals and secularists commonly tell us that religion is related to the evolution of morality. Religion is nothing more than a vehicle for morality, and belief in supernatural beings was necessary to frighten people into obedience to moral codes. As humanity 'grows up', it will discard the outdated supernatural elements entirely and just have a morality by itself.

Stark shows that any link between morality and supernaturalism is tenuous at best. For instance, many of the pagan gods acted capriciously, or even malevolently, to other gods and to human beings. In addition, most native religions had essentially no concept of gods caring about what humans did or did not do.

## Trumpeting the end of Christianity—a miserable failure

There is a long—and dismally failed—history of predicting the demise of Christianity. Thomas Woolson, about 1710, told us that religion was about to disappear. Frederick the Great thought that Woolson was correct, only a little too pessimistic, and Voltaire proclaimed that religion would be gone by 1810. Instead, all these men passed into history.

Many 19th- and 20th-century thinkers also assured us that religion was a passing phase of human thinking. These included the Communist Friedrich Engels, anthropologist A.E. Crawley, sociologist Max Weber, and Sigmund Freud—who assured us that religion was the

greatest of neurotic illusions. Other "The End is Near (for religion)" failed prophets included C. Wright Mills, Anthony F.C. Wallace, and Peter Berger.

### Declining church attendance in perspective

Interestingly, Stark puts contemporary church attendance in temporal perspective. The notion—that today's European churches are empty—is asserted under the tacit assumption that they once were full. For instance, the piety commonly associated with the Middle Ages, in Europe, makes one intuitively suppose that virtually everyone then was a churchgoer. Stark shows that this was hardly the case. Many villages were located too far from a church, and transportation was not good. Chroniclers at the time wrote of low levels of church attendance overall, and a lack of seriousness by many of those who did attend.

The same considerations hold for recent times. While the Catholic Church was an unchallenged monopoly in Latin America, church attendance was low. With the growth of Protestant Churches, and Catholic responses to this challenge, church attendance increased and is now higher than ever.

### Alternatives to churchgoing

An unwillingness to attend church does not necessarily imply a rejection of Christianity. Still less does it necessarily imply a secular mindset. Rodney Stark notes that many non-churchgoers, in western Europe, profess to have a private Christian faith. He quotes British sociologist Grace Davie, who, faced with the fact that many more Europeans embrace Christian doctrines than attend church, refers to such people as "believing non-belongers". (Of course, this is in violation of God's command to attend church (e.g. Hebrews 10:25), but this is another matter and is not considered by Stark.)

In addition to all this, there are various forms of public religious devotion in existence other than the attendance of church. For instance, Stark points out that there are 6,130 active shrines in western Europe, and these draw over 66 million visitors a year, most of whom are religiously motivated and are not tourists.

### Secularism and human progress

Atheists like to tell us that, as humanity progresses, religion becomes less and less relevant, and that secularism is the sure result. The actual course of events does not support this contention. The decline in practised Christianity in western Europe started, to a serious extent, in the 1960s. Obviously, this was long, long after western Europe had attained a high standard of living.

Atheists also would have us believe that, with increasing knowledge, humans realize that the supernatural is an obsolescent concept. Again, this is not borne out by the facts, even if we accept the atheist's premise. The decline in religious observance, among western Europeans, does not mean that they have discarded the supernatural. To the contrary: Surveys show that a significant fraction of western Europeans believe in such supernatural things as fortune tellers, astrology (figure 1), and lucky charms. Obviously, these are as anathema to the 'scientific' rationalist as is belief in God.

### Secularism in the USA

Claims of a secularized USA must, first of all, be kept in perspective. The demise of American Christianity had been predicted before, and in vain. Decades ago, the mainline denominations reigned supreme and they preached modernism. The World Council of Churches, especially, promoted theological liberalism. American Christianity, especially its supernaturalism, was thought to be in inevitable decline. Instead, precisely the opposite happened. The mainline denominations shrunk, and evangelical and fundamentalist

**Figure 1.** Far from rejecting supernaturalism, the unchurched in many nations are *more* likely to believe in astrology than the churched.

churches thrived. In Roman Catholicism, overall practice has declined, but conservative Catholic movements have flourished.

The reasons are not hard to discern. If the church is an echo of humanism, why bother with the church? If the church teaches wishy-washy platitudes, or pop psychology, who is going to be inspired by *that*?

In recent years, there have been gloating statements, in the media, that the United States is following western Europe into secularism. Stark examines, and refutes, these claims.

The author challenges the validity of statistics that purportedly show a decline in churchgoing in the USA. A many-decades analysis shows no change. In addition, it is not correct to say that churchgoing is declining among young adults, because this age group has always tended to have relatively low churchgoing rates. He also disputes claims that evangelicals are more liberal, on social issues, than their elders.

Stark clarifies the figures that show that more Americans consider themselves "Nones" than ever before. Why? It turns out that the religiously unaffiliated Americans used to claim affiliation with some religion, but now the religiously unaffiliated more commonly declare themselves "Nones". Thus, what we are seeing is not an increase in secularism, but a decrease in the power and prestige of denominational labels.

## Why secularism in Western Europe

In common with many commentators, Stark considers the state-church system as one that is a detriment to Christianity. The western European state church is effectively lazy, moribund, modernistic, and steeped in dead formalism, because it gets state funding, and has no incentive to deliver a good product and to engage its attendees. There is also no competition. In contrast, the church in the USA is relatively vibrant because of the religious pluralism and competition.

The situation in western Europe, with its state-church system and its modernism, can even get more egregious. In 1963, the English Anglican bishop John A.T. Robinson published his *Honest to God*, in which he essentially rejected the existence of God. More recently, Danish priest Thorkild Grosboll was even more open in his disbelief in God. Obviously, if even openly atheistic clergymen can retain their positions in a church, and feel no need to even hide their atheism, something is very wrong!

Over a century ago, the church in Sweden had begun to be afflicted with atheism. Local elected boards largely controlled the church, and the choosing for these positions was driven by politics, not religious conviction. Worse yet, for several generations, the favoured candidates for these church boards were socialists, and this put avowed atheists in charge of the church in Sweden. The fox was allowed to govern the chicken coop!

## The 'non-religious' Japanese and Chinese

The vast majority of the people of Japan and China say they have no religion. This has been cited as a fact demonstrating that a large fraction of modern humanity can do perfectly well without religion in general and supernaturalism in particular.

To begin with, the 'no religion' notion presupposes that any form of religion must necessarily be synonymous with 'organized religion' in the Christian sense. It is not. The 'no supernaturalism' notion presupposes that eastern religions are necessarily non-supernaturalist. Again, the truth is otherwise.

Stark points out that Shinto is not something that Japanese belong to. They *use* it. Some 90% of Japanese visit Shinto shrines and a comparable fraction have a Buddhist altar in their home, wherein the spirits of their deceased ancestors are believed to reside. Shinto teaches that there are spirits resident in rocks, trees, animals, and places. The Japanese version of Buddhism is not indifferent to supernaturalism. Buddha himself is worshipped in many temples. The Japanese version of Buddhism teaches of Nirvana not as a state of non-existence, as in classical Buddhism, but as a form of afterlife bliss that is somewhat comparable to the Christian teaching of heaven.

Are Chinese generally non-supernaturalists? Hardly. Stark points out that, just in the past year, 72% of Chinese had indicated that they had venerated ancestral spirits by their graves. Not a few Chinese informally practise folk religions. Finally, even though Confucianism is supposed to be a philosophy and not a religion, many Chinese pray to statues of Confucius for blessings and benefits.

## Islam

According to conventional wisdom, Islam is the fastest-growing major religion on Earth, and Islam is destined to soon overtake Christianity as the world's largest religion. However, Stark cites recently available figures that indicate that the much-touted fertility of Muslims is now in decline, and so Islam will not overtake Christianity. In addition, Islam has proven to be less capable of attracting new converts than Christianity.

Even more has been said about the low fertility of native Europeans. On this basis alone, it has been argued that, within a few decades, Europe will be predominantly Islamic. However, the actual decline of Islamic fertility means that this will

not happen—unless, of course, there is massive immigration of Muslims to Europe. This has lately been in the news, with increasing number of Europeans opposed to such immigration.

It has long been known that Orthodox Jews have many more children than secular Jews. However, Stark shows that this is also, to an extent, true of religious Europeans in comparison with secular Europeans. For this reason alone, it is doubtful if either Orthodox Jews or devoutly Christian western Europeans will die out in the foreseeable future.

### Attempts to discount third-world Christianity

Liberals and secularists have various stock explanations for the turning to Christianity of peoples among whom Christianity had never previously been common. For instance, there is the notion that some locals had effectively been 'bought'. They had allegedly professed Christianity in order to obtain material rewards from missionaries or from the colonial powers with whom missionaries were (correctly or incorrectly) associated. This included the so-called 'rice Christians' of China. The facts are otherwise. There have not been Christian missionaries in China for many decades, yet Christianity has not only persisted in the absence of tangible rewards, moreover under severe Communist persecution, but has actually grown to levels not even imagined several decades ago.

Now consider sub-Saharan Africa. The European mainline denominations, such as the Anglican Church, had stopped sending missionaries by the 1930s, based on the notion that the supernaturalism in Christianity is invalid, that it is chauvinistic to think that one religion can be more true than another religion, and that the presumed superstition in the Christian religion is essentially no different from the superstition of native religions.

In spite of all this, Christianity has grown to a spectacular extent in sub-Saharan Africa in recent decades. It is a home-grown faith, in no sense dependent upon European or American influences.

### Religion: a crutch for the weak? Hardly

Liberals and secularists tacitly adhere to the ideas of Karl Marx, who proclaimed that religion was the opium of the people. Belief in an afterlife ("pie in the sky") was a palliative for the poor and their wretched condition. In addition, religion was something for the uneducated and unenlightened, who did not know any better.

Stark soundly demolishes these arguments. He shows that, in many Third-World nations, those who practise religion are, if anything, more likely to be fairly well off and educated than to be poor and uneducated. Chinese who convert to Christianity are likely to be college educated. Christians in India are more likely to have entered college than Hindus, Buddhists, or Muslims.

### Religion as unthinking habit? No!

Failing all else, secularists would have us believe that people are essentially secular—in that they mechanically perform their religions, but do not really think in religious terms. For instance, it has been argued that American religiousness is only apparent and outward, because Americans do not experience the world as enchanted—as a place filled with spirits, demons, and moral forces.

The facts are otherwise. For instance, more than half of Americans believe that they had been protected by a guardian angel, that it is possible to be possessed by demons, and that dreams can sometimes foretell the future.

The very fact that people decide to be observant, or non-observant, of their religion, itself implies a choice. In addition, in the USA, nearly half of the religious are practising a religion other than that of their parents.

Finally, surveys of the world's population refute the contention that people are merely engaging in rote religious behaviour. For instance, most people in just about every place on Earth indicate that they often or sometimes think about such things as the purpose and meaning of life. With few exceptions, only single-digit percentages of people, the world over, agree with arch-atheist Richard Dawkins that life has no ultimate purpose.

### Conclusions

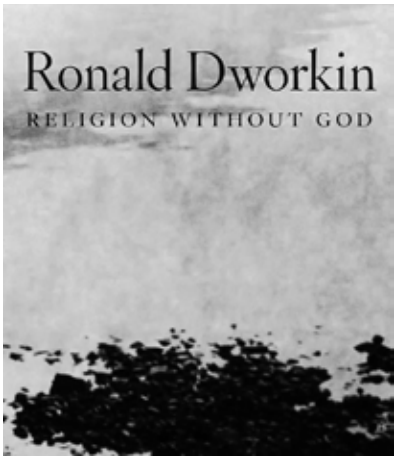
The end of Christianity is greatly exaggerated. Not only so, but, in some parts of the world, precisely the opposite is the case. In recent decades, there has been a revival not only in Christianity, but also Islam, Judaism, Hinduism, and other religions.

The problems with the state churches of western Europe inform us that western Europeans are not rejecting Christianity, much less becoming atheists. They are rejecting a poor caricature of Christianity. In addition, the tendency of many of the unchurched to have a 'private Christianity', and to explore alternative spiritualities, tells us, at minimum, that they have not rejected supernaturalism, nor embraced 'scientific' rationalism.

The call to renewed evangelization is clear. Many of the western European unchurched people would respond to the Gospel, were it presented in an accurate and lucid manner, and would join vibrant, Bible-believing churches, if these were available.

# Another upshot of an evolutionistic worldview

***Religion Without God***
*Ronald Dworkin*
Harvard University Press, 2013




*Chris H. van Zyl IV*

Ronald Dworkin (1931–2013) is considered one of the foremost liberal philosophers of law of the past 40 years.[1] In his last and posthumously published book, *Religion Without God*, Dworkin essentially argues for the exclusion of the theistic religious worldview from the public sphere, and for the demotion of the right to freedom of religion.[2]

Dworkin notes that the background to his arguments is the 'religious wars' which thrive like a cancer in the United States of America (7–10). He seemingly tries to tone down these 'wars', but the consequences of his views ultimately defeat his gesture. Why? Because of his evolutionistic worldview, which is fundamentally in opposition to the theistic creationist worldview.

## Religious atheism?

Dworkin argues that "religion is deeper than God" (p. 1). Dworkin pivots his argument on the assumption that the value part of traditional theistic religions, such as Christianity and Judaism, is separate and independent from the science part (pp. 22–24). The science part relates to factual questions on the origins of the universe and mankind. The value part relates to how one should live.[3]

The fact/value dichotomy, to which Dworkin adheres (see pp. 26–27), asserts that value plays no role in the determination of facts, i.e. there is a strict separation between science and morality. Dworkin further argues that the 'fact' of God's existence plays no role in moral epistemology. He places the 'fact' of God's existence in the science part. He sees the theory of creation as belonging to the science part by virtue of its content, but not by virtue of its being a scientific argument in itself (p. 23). God therefore does not belong to the value part (pp. 22–23). In other words, whether God exists or not has no effect on "the truth of religious values" (p. 25).

The fact/value argument conflicts with the Christian view that God's existence is not only an actual fact, but that this fact is relevant, indeed fundamental, to morality. There cannot be an absolute separation between fact and value because all men have fundamental convictions which determine how they observe facts, interpret facts and describe facts. Furthermore, the fact of God's existence grounds objective morality, without which fact we descend into moral relativism or subjective values.

Dworkin's separation of the science and value part of traditional theistic religions may be illustrated with two imaginary jars, Jar S and Jar V. 'God' goes into Jar S and values into Jar V. These jars are independent of each other but not unconnected. That is, 'God' can still influence what goes on in Jar V, but that does not mean Jar V is dependent on Jar S. What is in Jar V, however, is all that is necessary for what Dworkin defines as 'religion'.

Christians may put 'godly convictions' into Jar V that are 'parasitic' on Jar S, such as worship and prayer (p. 24). However, 'religious atheists' reject these 'parasitic' convictions because they believe in the two objective 'judgments about value' that make up the 'religious attitude' (pp. 10–11, 24). The first is the belief that life has 'intrinsic meaning' and hence we should 'try to live as well as possible' (pp. 11, 24). The second is the belief that nature has 'intrinsic wonder and beauty'. These two properly belong in Jar V.

Hence, atheists (or at least the 'religious atheist' (p. 12)) and theists both have a 'fundamental religious impulse' (p. 146) and can consequently share (Jar V) "the conviction that there is, independently and objectively, a right way to live" (p. 155). Dworkin hopes that this realisation will tone down the 'religious wars' because what divides atheists and theists (the 'fact' of God or Jar S) is very small compared to their common faith in value (or Jar V) (pp. 146–147).

## Freedom of religion?

As Dworkin's redefined 'religion' is no longer limited to theism, why should special legal protection be given to only theistic religious believers? But if we take it beyond theism, then where do we stop? Dworkin fears that we may end up giving special legal protection to "even the wildest ethical eccentricity" (p. 124). Dworkin's solution is to demote the 'troublesome right' of freedom of religion to an aspect of the "general right to ethical independence" (pp. 132–133).

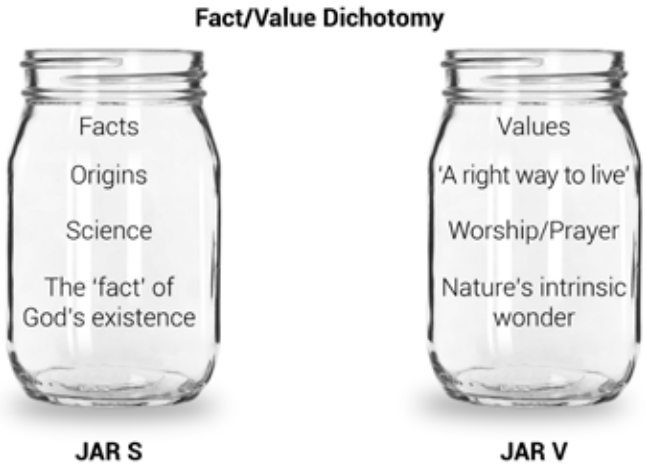



**Figure 1.** Dworkin's arguments in *Religion Without God* mostly pivot on the false gulf between science and morality—the idea that 'God' is somehow irrelevant to morals.

What are the consequences of this demotion? In essence it privatizes religion (traditionally understood and not as Dworkin's 'religious atheism'). This means that it removes the voice of the traditional religious believer from the public sphere, but includes the voice of the non-religious believer. Alarmingly, Dworkin declares that if we accept "religious freedom as part of ethical independence, then the liberal position (on, for example, abortion or homosexuality) becomes *mandatory* [emphasis added]" (p. 145).

## Public education

Dworkin admits that the toning down of the 'religious wars' may be too much to hope for (p. 147). Indeed, this will hardly be the case when the religious believer is excluded from the public sphere. This is evident from how he deals with the question on whether Darwinian evolution or creationism should be taught in public schools (pp. 142–144). He admits that the teaching of Darwinian evolution in public schools *may* violate the general right to ethical independence of those who hold a different worldview. However, Dworkin says that while creationists want to impose their worldview on students, it is an 'implausible hypothesis' that evolutionists try "to persuade students away from theistic religion". What should be taught in public schools on the fundamental question of origins of the universe and mankind is thus answered by what Dworkin supposes is the motives (or not) of each side.[1]

While the improper proselytizing of a particular worldview should be avoided, Dworkin seemingly fails to realize that this caution applies to *all* worldviews regardless of whether it is based on religious or non-religious beliefs.[4]

## Everyone believes something

It is important to keep in mind that every person has a fundamental set of beliefs which "determines how they see the world ...".[5] The simple flaw in Dworkin's liberalist arguments, based ultimately on evolutionistic beliefs, is this: as society consists of many believers, those who believe differently than Dworkin will have their freedom arbitrarily and significantly restricted, which freedom goes to the very heart of personhood and human existence.

## Conclusion

So where does 'religious atheism' come from? Steven Smith, Warren Distinguished Professor of Law at the University of San Diego, writes that the 'salient philosophical and cultural divide', in Western thought at least, is not between believers in objective value and believers in subjective value as Dworkin would have it.[6] Instead the divide is between those who see the universe as created for a purpose and those who view it as the result of mere chance.[6] Furthermore, the difference between design and chance has profound implications for the questions of life, law, and politics.[6] In other words, each worldview has moral implications.[7]

Like most arguments which exclude the traditional religious believer form the public sphere, or which prohibit creationism being taught in public schools or which mandate liberal views, the consequences of Dworkin's views can be traced back to an evolutionistic worldview. Your worldview will determine how you see the relationship between religion and the public sphere and whether creationism has a role in public education. Evidently, Dworkin's worldview guides his answers to such important questions.

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3. See, however, Benson, I.T., Do 'Values' Mean Anything at All? Implications for Law, Education and Society, *J. for Juridical Science* **33**(1):1–22, 2008 (available at ufs.ac.za). Iain Benson, a renowned international legal philosopher, writer, professor and legal consultant, argues against the subjective 'language of values' which confuses moral understanding. He posits instead the objective 'language of virtues'.
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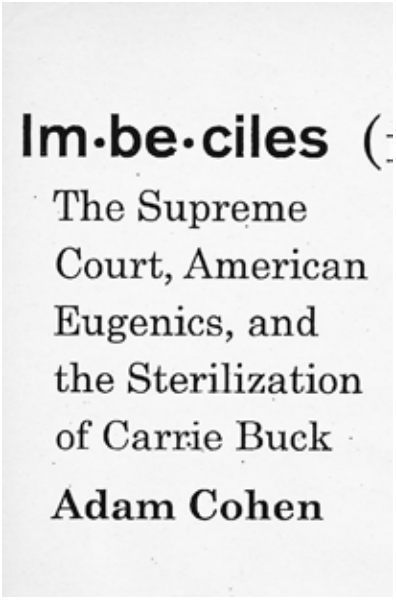
5. See Carter, R.W. (Ed.), Evolution's Achilles' Heels, Creation Book Publishers, p. 234, 2014.
6. Smith, S.D., Is God Irrelevant? *Boston University Law Review* **94**(4):1339–1355, 2014; p. 1355.
7. See Carter, ref. 5, pp. 238, 245.

# Imbeciles: a court ruling that history has proven to be moronic

***Imbeciles: The Supreme Court, American eugenics, and the sterilization of Carrie Buck***

*Adam Cohen*

Penguin Press, NY, 2016




*Jerry Bergman*

This book chronicles an incredibly shameful period in American history that was openly based on Darwinian eugenics. Eugenics supporters believed that to help perfect humanity it was necessary to determine who should and should not have children, based on characteristics such as I.Q. test results, race, and promiscuity among women (p. 6). This movement was active from 1895 to as late as 1981 (p. 11). This book chronicles the infamous 1927 *Buck vs Bell* Supreme Court decision that allowed eugenic forced sterilization. The ruling has never been overturned, or even limited, by the Supreme Court, although *Skinner v. Oklahoma* (1942) ended compulsory sterilization of criminals and reduced sterilization rates in general. A few states are still claiming that they have the right to forcibly sterilize some persons (p. 32). In fact, "Virginia forcibly sterilized at least 7,450 'unfit' people between 1927 and 1979" (p. 1). In short, in the 1920s the United States

> "… was caught up in a mania: the drive to … perfect humanity. Modern eugenics, which had emerged in England among followers of Charles Darwin, had crossed the Atlantic and become a full-fledged intellectual craze. The United States suddenly had a new enemy: bad 'germplasm,' and those who carried it. The 'unfit,' the eugenicists warned, threatened to bring down not only the nation but the whole human race" (p. 2).

The book chronicles the legalization of forced sterilization for those persons considered inferior by focusing on the Carrie Buck Supreme Court case. The decision was written by Justice Oliver Wendell Holmes Jr, widely considered to be "one of the greatest legal minds—if not the greatest—in American history" (p. 1). The 8–1 majority opinion upheld the Virginia eugenics law (pp. 226, 239–240). Formerly a social Darwinist, Holmes evolved further into a eugenics supporter. He even wrote approvingly of "putting to death infants" to further eugenics goals (p. 242). Those supporting the decision included leading professionals from the medical, academic, legal, and judiciary establishments (p. 7).

Cohen, a Harvard Law School graduate and former president of the *Harvard Law Review*, has done an outstanding job documenting several aspects of the American eugenics movement, including the influence of Darwinism and the role of reformers and progressives in advocating the sterilization of various categories of people. Cohen focuses on how Carrie Buck came to be the lead character in *Buck v. Bell*. The American eugenics movement began with numerous prominent scientists who formed organizations to

> "… promote eugenics, with names like *the Committee to Study and to Report on the Best Practical Means of Cutting Off the Defective Germ-Plasm in the American Population*. Social reformers embraced biology as the fastest route to their goal of a better world" (p. 3).

One of many leading academics who supported the decision was Dr Albert Priddy, then Superintendent for Virginia's home for Epileptics and Feeble Minded. Also prominent was Princeton University Ph.D., Harry Laughlin, Director of the Eugenics Record Office of the Carnegie Institute in New York, who argued for the state in the Buck case. He was also a major supporter of the 1924 immigration act designed to keep what he viewed as inferior races, especially Jews, out of the United States (p. 8).

Professor Aubrey Strode was the author of the Virginia sterilization statute and the legal representative for the state before the court. The unfortunate victim chosen to be the test case was Carrie Buck, who had been placed in Dr Priddy's institution for being a 'feeble-minded', uneducated unwed mother living in poverty.

Cohen documented in chapters three to eight his conclusion that many of the states' claims in the *Buck vs Bell*

case were very troubling, including the fact that

> "The Supreme Court got the most basic facts about Carrie Buck and her family wrong, and relying on those errors it allowed a terrible injury to be done to her. The court exhibited a shockingly narrow conception of individual rights. It gave its unqualified endorsement to a cruel procedure. And when a young woman came seeking to be protected from an immense wrong, the court showered her with insults and allowed her to be harmed" (p. 13).

The many facts ignored by the Darwinian eugenic supporters include that Miss Buck's child was a result of her having been raped by her foster parents' nephew, and her school records documented that she was not feeble minded but rather a good student of average intelligence. Her daughter was a mere 8 months old at the time, making all claims of feeble mindedness close to worthless. Nonetheless, the eugenicists prevailed in the Supreme Court. This ruling opened up the floodgates, resulting in many thousands of eugenic sterilizations. The social climate of the time was very conducive to the Buck case ruling because eugenics had permeated the popular culture to the extent that several bestselling

> "… books explained the concept of 'race betterment' to an eager public, and mass-market magazines urged their readers to do their part to breed superior human beings. The 'inspiring, the wonderful, message of the new heredity,' *Cosmopolitan* explained was that it offered the promise of preventing once and for all the birth of the 'diseased or crippled or depraved.' Hollywood released a feature-length horror movie, which filled theaters from coast to coast, showing the frightening consequences of allowing 'defective' babies to live" (p. 3).

In the early 20th century, eugenics was also successfully used to keep most Italians, Eastern European Jews and other 'undesirables' from entering the US. The reason was eugenics supporters feared that intermarriage with white Americans would adversely pollute the US. gene pool. Included in the ban were thousands of Jews who would later perish in the Holocaust, including Anne Frank. In 1941, her father, Otto Frank, desperately wrote several letters to the United States government for permission to immigrate, but as a Jew he was turned down (p. 135).

Darwinian eugenic ideas had rapidly spread to Sweden, Norway, Finland, Great Britain, and, of course most notably, to Nazi Germany (p. 302). When the final solution was implemented, Germans with mixed Aryan and Jewish blood were sterilized as an alternative to extermination, resulting in 375,000 or more sterilization orders (p. 303). In fact, during the Nuremberg Trials, the Nazis used the eugenic policies developed in the US, and even the Carrie Buck court case itself, to justify their war crimes. Cohen writes:

> "The Nazi Party, which was on the rise in Germany, used America as a model for its own eugenic sterilization program. The Supreme Court's ruling influenced the *Erbgesundheitsgerichte*, the Hereditary Health Courts that decided who should be forcibly sterilized. And at the Nuremberg trials that followed World War II, Nazis who had carried out 375,000 forced eugenic sterilizations cited *Buck v. Bell* in defense of their actions" (pp. 10–11).

The implications of this case, as applied internationally, were enormous, but they are also important to current Western domestic problems now that scientists are routinely using genetic recombinant techniques for plant and animal research. Scientists have also developed god-like 'designer babies' procedures that would have been inconceivable in the 1920s. Supporters may rationalize that gene modifications are for the sake of the baby, and this may often be true, but the real reason may be to improve society. Entering that territory places us in the danger of repeating the atrocities exemplified by the Carrie Buck case. One example is that therapy involves a whole host of diagnoses or traits where genes play a role, diagnoses such as autism and Down Syndrome, and traits such as eye colour.

**Figure 1.** Justice Oliver Wendell Holmes, Jr

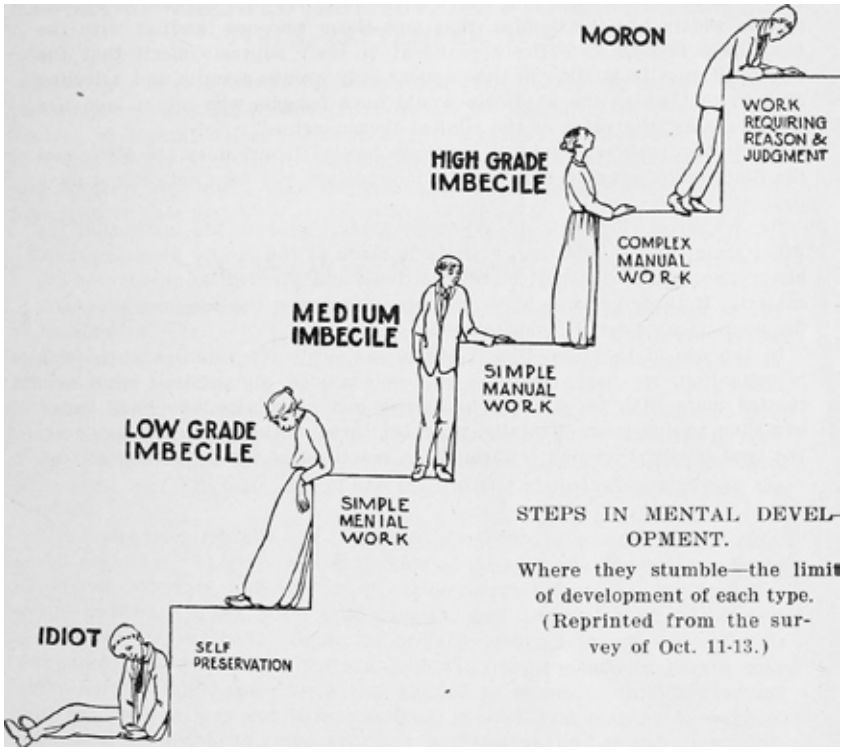



**Figure 2.** An illustration of the intelligence ranking used in the 1920s. From *The Survey,* 11 October 1913, public domain.

## The universities' involvement

In the 1900s, the "nation's universities churned out large" numbers of reports "documenting the serious problem of feeble-mindedness" in America (pp. 55–54). When eugenics developed to the point where the various eugenic movements concluded that they had to do something about the problem of inferior human breeds (p. 60), the next step was determining what to do. One approach, popular for some time, was institutional segregation of 'defective' humans in camps or farms during their child-bearing years. The enormous cost of this approach created a large burden on taxpayers (p. 64). To help pay this cost, supporters proposed work training to help the colonies become self-supporting, an unrealistic goal that was never realized.

Another solution was castration, a method of sterilization viewed as barbaric until Dr Albert Ochsner published his less barbaric technique involving severing the vas deferens (p. 65). Today called a vasectomy, it is still used for voluntary male birth control. Efforts to sterilize women were less successful, and included cutting the fallopian tubes. In one study, close to three percent of salpingectomies (removal of the Fallopian tubes) ended in fatalities. Hysterectomy was another approach that was widely used for decades. One approach, prohibiting those judged inferior to marry, failed due to the inability of controlling sex outside of marriage. Laws requiring involuntary sterilization was the method often used until the eugenics movement died (at least under that name) in the late 1970s.

## Professional support for eugenics

Sterilization of individuals who were considered "a perpetual menace, a constant source of trouble and danger" was promoted "largely by progressives, intellectuals, and professionals" (p. 11). Dr William F. Drewry of Central State Hospital, Petersburg, VA, believed the answer lay in preventing the feeble minded from reproducing "by the relentless hand of science, under sanction and authority of law" (p. 80). The most important group that advocated

> "… eugenic sterilization was the medical establishment. Major medical journals ran articles by prominent academics that endorsed sterilization, often in fiery terms. The normally staid *Journal of the American Medical Association* took an apocalyptic turn when Dr. William T. Belfield, a professor of surgery at Rush Medical College, took to its pages in 1908 to advocate sterilization laws. The title of his article, which urgently called for sterilizing criminals and mental defectives, was 'Race Suicide for Social Parasites'" (p. 56).

Furthermore, the medical establishment not only openly supported

> "… eugenic sterilization but did so with near unanimity. No prominent medical professors or surgeons publicly opposed the sterilization movement—or if they did, they were not being heard. One survey found that every article on the subject of eugenic sterilization published in a medical journal between 1899 and 1912 endorsed the practice" (p. 66).

Importantly, this included even the most prestigious professionals:

> "The highest echelons of the medical profession also largely supported the eugenics movement. At the American Academy of Medicine's first meeting of the twentieth century, in June 1900, its president called for laws to prevent … '"Crime, Pauperism, and Mental Deficiency.' Dr. G. Hudson Makuen argued that medicine

as it was currently practiced was counterproductive. 'We prolong the lives of weaklings,' he said, 'and make it possible for them to transmit their characteristics to future generations'" (p. 56).

Darwin made the same point in his 1871 book *The Descent of Man*. Scientists were another group very active in supporting eugenic sterilization. The most influential eugenic sterilization advocate, Professor Harry Laughlin,

> "… was a scientist, with a doctoral degree in biology from Princeton. The most prominent organization that promoted eugenic sterilization in the early days of the movement, the American Breeders' Association's Committee of Eugenics, had distinguished scientists as members, including its chairman, David Starr Jordan, an ichthyologist who was the first president of Stanford University" (p. 67).

## Church support

Theologically liberal religious leaders also were actively writing articles for religious journals and preaching sermons from the pulpit. For example:

> "The Reverend Harry F. Ward, a founder of the Methodist Federation for Social Service and a professor of Christian Ethics at Union Theological Seminary, wrote in the magazine *Eugenics* that Christians and eugenicists were fighting a common battle because both were concerned with the 'challenge of removing the causes that produce the weak.' The Reverend Phillips Endecott Osgood, the rector of St. Mark's Church in Minneapolis, … urge[d] people of faith to purge 'the "dross" of humanity' [by eugenics]" (pp. 60–61).

Decades later, the United Methodist Church formally apologized for "the prominent role its churches and pastors [had] played in the eugenics movement. 'As the Eugenics Movement came to the United Sates,' the church said regretfully, 'the churches, especially the Methodists, the Presbyterians, and the Episcopalians, embraced it'" (p. 61). The many religious leaders that actively promoted eugenics included "the Very Reverend Walter Taylor Sumner, dean of Chicago's Protestant Episcopal Cathedral of Saints Peter and Paul" who "announced in 1912 that he would only marry couples with a 'certificate of health' from a reputable physician" (p. 56). Not long afterwards:

> "[T]he *New York Times* reported that two hundred Chicago clergy [had] adopted a resolution 'urging pastors to direct their energies toward creating public opinion indorsing [sic] Dean Sumner's plan.' …New York's West End Presbyterian Church was an organizing center [of eugenics], with the Reverend Dr. A. E. Keigwin convening his fellow Protestant clergy to 'push a eugenics campaign'" (p. 56).

## Newspaper coverage

Many major newspapers extensively covered eugenics on both their news and editorial pages. The *New York Times* was especially active in giving supportive "coverage to the eugenicists' agendas" (p. 60). An example, citing American Eugenics Society figures, "an organization it described as having 'for its aim the betterment of racial standards throughout the country'" they noted was that eugenics courses were proliferating in colleges (p. 60). Some newspapers were expressly supportive:

> "When Louisiana's legislature was considering a major eugenic law, the *New Orleans Times-Picayune* gave its endorsement. In several editorials, it insisted the bill was not a 'wild eugenic scheme' or a violation of human rights. It was, the editorial board insisted, 'simply a step to protect the community and the human race against the … unfit'" (p. 60).

Families also entered eugenic competitions requiring them to

> "… submit to medical and psychiatric examinations and take intelligence tests. Like the livestock, the winning families were awarded prizes. The 'fitter family' contests were enormously popular ... . 'All the newspapers were glad to cooperate,' a leader of the American Eugenics Society later recalled. 'No activities of the society got so much publicity'" (p. 61).

## White supremacist racism

Physician Dr Bernard Barrow reported in the 1910 issue of *Virginia Medical Semi-Monthly* that he had sterilized five 'mentally deficient' black men. He "was blunt about the role his racist views played in his decisions to sterilize. 'The negro' was 'a savage race' that could not solve its own 'social and sanitary problems,' he said. The responsibility lay with 'the stronger race—the white man'" (p. 75).

The University of Virginia's faculty was a major "force in support of eugenics in the state, the nation, and even the world" (p. 73). Professor Robert Bennett Bean, "a national leader in racist eugenics," inspired "generations of white supremacist scientists with his research on subjects like, as the title of one of his papers expressed it, 'Some Racial Peculiarities of the Negro Brain'" (p. 73).

## Opposition to eugenics

The group most organized against the eugenics movement was the Roman Catholic Church, which actively mobilized against sterilization laws to the degree that in

> "… states with large Catholic populations, including Massachusetts and Louisiana, the church's opposition played a crucial role. Politicians in these states … 'knew they faced political suicide by backing eugenic statutes.' In Louisiana, where half the voters were Catholic, reformers and public health leaders repeatedly backed sterilization bills, but without success. The New Orleans archbishop mobilized statewide opposition to what he called 'unnatural legislation.' One legislator, a grand knight in the Knights of Columbus, the Catholic fraternal organization, denounced eugenic sterilization, saying, 'God created these poor unfortunates just the same as he did legislators'" (pp. 67–68).

Indicative of the Catholic church's opposition to eugenics was Pope Pius XI's encyclical *Casti connubii* ('*Of Chaste Marriage*'), 31 December 1930. This affirmed the church's opposition to artificial contraception, and also included strong denunciations against eugenics laws, forced sterilizations, and abortion (p. 67).

The early opposition to eugenics was mostly from non-scientists and doctors. After a Washington state law was successfully challenged, pro-eugenic laws were defeated in the next seven states (p. 101). The reasons were often moral, as illustrated by one state, which illustrated the fact that

> "… not everyone was caught up in the eugenic mania, and the resistance was not just coming from the courts. In several states, governors vetoed eugenic sterilization laws and delivered strongly worded indictments. Nebraska's governor insisted his state's sterilization bill seemed 'more in keeping with the pagan age than with the teachings of Christianity,' and he declared in his veto message that 'man is more than an animal'" (p. 101).

Eugenics supporters realized that, in view of the many court losses, they must take a test case to the US Supreme Court. To do this, they needed the authority and prestige of science. Of the many leading professors that could testify, they selected Harry Laughlin (pp. 106, 122). Laughlin worked for the former Harvard and University of Chicago professor, Charles Davenport, who founded Cold Spring Harbor Biological Laboratory. Davenport believed that "society must protect itself" from inferior humans, reasoning just as society "claims the right to deprive the murderer of his life so also it may annihilate the hideous … hopelessly vicious protoplasm" of inferior humans (p. 110).

Davenport was able to create a board of scientific directors from major Ivy league universities to support eugenics. His many books on breeding better humans soon became "assigned reading in many of the eugenics courses that were [then] springing up at colleges and universities across the country" (p. 112). Furthermore, the enthusiasm for eugenic sterilization, which had been very "promising in 1913, was now decidedly less so—and the judicial momentum was strongly against it" (p. 101).

## Towards *Buck vs Bell*

Because of the growing opposition: "… supporters of the Virginia sterilization law would need to create the strongest possible case. They had drafted the law with considerable care, drawing on expert advice on how to make it resistant to constitutional challenge. Then they had chosen, in Carrie Buck, a plaintiff they believed demonstrated particularly well why eugenic sterilization was necessary" (p. 101).

They now had the backing of much of the scientific establishment and the perfect test case. The scientists argued that Carrie's mother was feeble minded, as were Carrie and her daughter. The evidence included 'expert' testimony, such as claims that the Buck family just 'seemed feeble minded' Laughlin's goal was to sterilize 15 million people, and after the favourable Supreme Court's ruling he was given a green light to reach this goal.

## Germany learned from American eugenics

Ironically, even though the German academic eugenics movement was active as early as 1904, the German eugenicists were concerned that the Americans were surpassing them in the development and application of Darwinism to society. To deal with this problem, the German scientists held international eugenics meetings to attract American scientists, including one event held in Dresden, Germany. With America's help, German eugenicists caught up and would go one step beyond the Americans. Instead of only sterilizing their inferior 'human protoplasm', they murdered those persons deemed racially or otherwise genetically inferior. Cohen wrote that Holmes's decision aphorism "three generations of imbeciles are enough" was "one of the most notorious statements to appear in a Supreme Court opinion" that was a "cruel insult that has rarely been delivered by a majority of the court—even in cases involving the most cold-blooded of criminals" (p. 270).

I would highly recommend this well-documented book that brings to light the history of this dark side of science and, especially, Darwinism.

# Thoroughly predictable compromise

***Genesis, The Story of God: Bible Commentary***
*Tremper Longman III*
Zondervan, 2016

*Lita Cosner*

Sometimes it's predictable that an author is going to compromise regarding Genesis and even what compromises he's going to make. If he's not strong on the length of the days of creation, for example, he will probably bring out the old argument, "How can there be normal-length days before the sun?" If he believes that Genesis 1–2 tells us nothing about the age of the earth, he probably won't think that Genesis 5 and 11 can tell us anything about chronology, either. This sort of predictability makes Tremper Longman's Genesis commentary in the Story of God series a tedious read.

The commentary uses the NIV 2011 translation of Genesis; a translation which, in some places, has been criticized by many as having problems with the gender-neutral language. The main translation problem of interest to creationists would be its interpretation of Genesis 2:5: "Now, no shrub had appeared on the earth and no plant had yet sprung up, for the Lord God had not sent rain on the earth and there was no one to work the ground". This is problematic because it introduces a contradiction between Genesis 1 and 2 that does not occur in the Hebrew. The ESV correctly translates Genesis 2:5 as "When no bush of the field was yet in the land and no small plant of the field had yet sprung up …"—i.e. the sorts of plants that did not yet exist depended on human cultivation, and may even be associated with the Curse of Genesis 3. But the NIV 2011 translation could be taken to say that Genesis 2 places the creation of mankind before plants, while clearly Genesis 1 places the creation of plants on Day 3 and humans on Day 6.

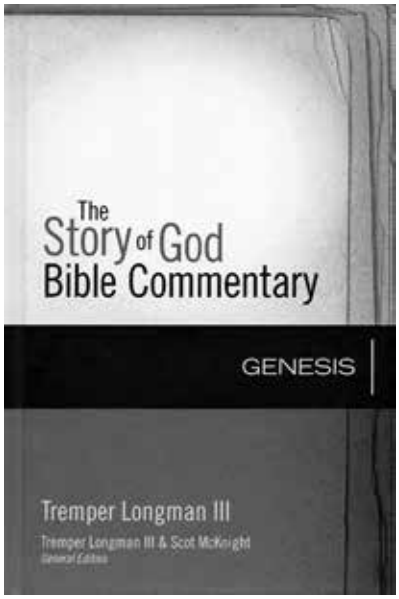
This commentary series seems to be aimed at interested laypeople, though pastors will no doubt use it as well, especially for sermon application. The discussion of the Hebrew in any given passage is limited, and usually emphasizes the author's own preference rather than listing the interpretive options. Clearly it is assumed the readers do not know Hebrew nor have the tools available to weigh the options.

## Affirms Mosaic authorship

Longman is surprisingly good when it comes to affirming Mosaic authorship. He notes,

> "Taking seriously the indications within the Pentateuch itself, along with the post-pentateuchal references to the Book/Law of Moses, one might conclude that the Pentateuch finds its origins in Moses, who used sources particularly in the writing of Genesis. The postmosaica indicate that there were editorial additions. These additions may only be the most obvious examples of textual material added after the time of Moses and we cannot determine precisely what was authored by Moses or added by later inspired editors" (p. 6).

While a less enthusiastic embrace of Mosaic authorship than one might wish for, it seems best to be charitable when possible, given that there is so much wrong with the rest of the book.




## Long-age interpretation

Longman gives a standard long-age interpretation of Genesis 1–11. One does not have to read far to get a clear statement of where Longman's priorities lie. He says,

> "Based on our present knowledge derived from science, the origins of the cosmos are to be located in the Big Bang that happened approximately fourteen billion years ago. The creation of *homo* [*sic*] *sapiens sapiens* occurred about two hundred thousand years ago. Certainly the biblical author had no knowledge of this expanse of time, but a modern reader knows the story of creation of the cosmos and human beings is a depiction of events that happened in the deep past" (pp. 7–8).

We can only guess about what the Bible tells us about origins, but we *know* what science tells us, and we must bow the knee!

While Longman admits to not knowing what symbolic theological

Tremper Longman III, author and professor

significance the lifespans in Genesis 5 and 11 might serve, he dismisses taking them literally fairly quickly (pp. 98–99), and even calls a literal reading of the Genesis 11 genealogy 'stilted' (p. 152). It is perhaps unfair to expect significant interaction with other viewpoints in what is obviously a very layperson-oriented text. But when one's own interpretation is vastly out of step with the historical Christian interpretation and with that of a good number of Christians today, one might look for some *indication* that there might be other ways to read the text. Instead, we find a self-assured statement that "Ancient genealogies did not function like modern ones and are often constructed for literary and theological purposes rather than historical ones" (p. 152).

In fact, it is uncertain how much historical data Genesis 1–11 can give us at all, in Longman's view. He never affirms one way or another whether he believes Adam and Eve were historical individuals, but he seems ambivalent about the *necessity* of a historical Adam and Eve who behaved in the way that Genesis relates.

### Global Flood

Interestingly, Longman affirms that Genesis intends to teach a global flood, but immediately argues that there is no geological evidence of such an event.

"Of course, the problem for the position that this is a worldwide flood is that there is not a shred of geological or archaeological evidence for such a flood and, in this case, one might expect there to be. Again, the problem may not be with our translation of the Hebrew text as a worldwide flood or with the lack of evidence for such a flood as it is with an inaccurate understanding of the genre of the text that would wrongly lead one to expect precise and literal historical reportage" (p. 119).

### Tepid on homosexuality

Today, the traditional biblical teaching on sexual ethics is under attack, so it is important for commentaries to help equip Christians to answer the apologetic and pastoral questions relating to homosexuality. While Longman does recognize that other passages in Scripture clearly teach that homosexuality is a sin, he (wrongly) identifies the sin of Sodom not as homosexuality but primarily as a lack of hospitality, limiting the apologetic usefulness of his comments on this passage.

### Give this one a miss

This review focused mainly on Genesis 1–11 as the section that would be of most immediate interest to the readers of this journal. There are few really problematic comments on Genesis 12 and following, but there are few insights that would be new, even to people who have access to other commentaries. Some of the applications he draws from various passages are good, but overall I found myself wanting more depth in the discussions.

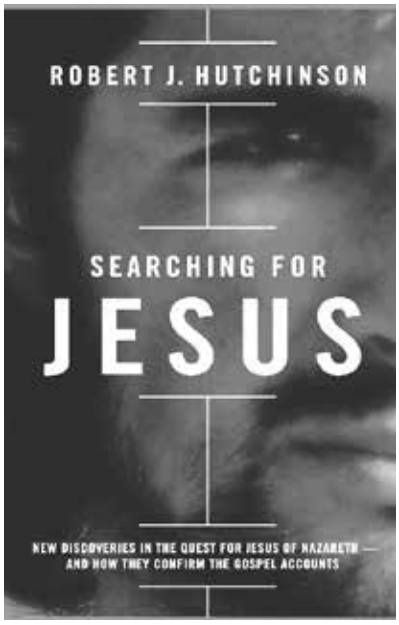
Then there are the occasional bizarre, out-of-left-field statements such as, "In keeping with biblical practice, it is wise to refer to God as 'he,' though not heretical to call God 'she,' as it would be to refer to God as 'it'" (p. 39). While I was grateful that Longman referred to God as 'he' (making my read-through of the commentary more bearable!) throughout his commentary, one wonders why he felt the need to make this point at all. And in case one is wondering whether this is an out-of-context quote, he did not defend this innovation except by saying that God is spirit and is thus not biologically male or female (although He has revealed Himself consistently in Scripture as relationally male, and Jesus was a human man, not a woman).

In short, it is difficult for me to think of an instance where this commentary would be a useful resource for better understanding the text of Genesis. While the idea of a new commentary aimed at the 'average church member' level of knowledge is admirable, this commentary is too full of compromising views for me to recommend it to anyone.

# New evidences for the factuality of the New Testament: A fascinating work

***Searching for Jesus***
*Robert J. Hutchinson*
Nelson Books, Nashville TN, 2015

*John Woodmorappe*




Author Robert J. Hutchinson earned a graduate degree in New Testament from Fuller Theological Seminary, and is currently a writer and author. Raised Roman Catholic (p. 278), Hutchinson professes to be a Christian, but is clearly not an orthodox one. For instance, he considers the factuality of the bodily resurrection of Jesus Christ as something that cannot be determined. (p. 246). However, as this book makes so vividly clear, his unorthodox stance makes his frequent evidentiary-based support of Christian orthodoxy all the more interesting.

In fact, throughout this book, Hutchinson professes to follow a middle course between the Orthodox Christian and the secular skeptic (p. xxvii). Even so, he makes it clear that the evidence is much more favourable to the conservative view of the NT than to the liberal one.

My own background is in science (geology and biology), not New Testament or theology. For this reason, I review this book as an outside observer. However, I have some informal background in apologetics, going decades back to my days as a college student and fan of Josh McDowell. This book is easy to follow for the non-specialist, as it is non-technical, and the author has a lucid style of expression. It is a somewhat frustrating item to review, as there is much more worthwhile information in it than can be discussed in a book review.

## A cautionary note

Although Hutchinson presents a wealth of interesting information, not all of his reasoning is sound. Consider one example. The author notes that Mark 5:25 states the inability of physicians to heal the woman with a blood flow, while the parallel account in Luke 8:43–44 mentions no physicians. He asserts that this was because Luke was himself a physician, and therefore did not want to present physicians in an unfavourable light. Clearly, this is conjecture on his part. Here are some possible alternatives: what if Mark mentioned the physicians because he wanted to go out of his way to dramatise the medical hopelessness of the situation? Pointedly, what was Luke to be ashamed of? Would not Luke, of all people, be aware of the fact that there are diseases that no earthly physician could possibly heal, and only the Great Physician could heal? (Of course, this is true of modern medicine, even though it is orders of magnitude more effective than ancient medicine. For instance, some forms of cancer (e.g. pancreatic) are still virtually-certain death sentences.)

## Bible contradictions?

The author realises that most alleged contradictions in the Gospels are not contradictions at all. They are simply variant accounts, based on viewpoint-based inclusion or omission of facts by the writers. He also realises the fact that, were there no discrepancies, it would only be a blow against authenticity, as it would mean that the authors of the Gospels had been in collusion—in agreeing to a predetermined story.

However, Hutchinson is not a proponent of biblical inerrancy, and he contends that some discrepancies are genuine contradictions, in that both accounts cannot simultaneously be correct, and so one of them must be wrong. As an example, he cites the women finding the empty tomb of Jesus, "they said nothing to anyone, for they were afraid" (Mark 16:8), which is supposed to be inescapably contradicted by Matthew 28:8, "They left the tomb quickly with fear and great joy, and ran to tell his disciples" (p. 17).

Unfortunately, the author does not analyse this further. Without consulting any apologetics works, I

can, using common sense, suggest some answers. Could the passages actually be saying that the women were filled with fear and joy, and decided to tell no-one *except* authoritative people—namely the disciples? Alternatively, if the "said nothing to anyone" means *absolutely* no-one, could there have been some change of attitude in the women? In other words, could it be that the women were, at first, too frightened to be willing to tell anyone (perhaps supposing that no-one would believe a group of women), but then, having belatedly realised that the disciples could check it for themselves, changed their minds and decided to run and tell the disciples?

### Jesus never existed?

A few extremists argue that He was an entirely mythical figure (which is perhaps ironic, because even the arch-atheist Communists admitted His existence—as a historical figure, sometimes ludicrously twisted into a proto-socialist). Hutchinson repeats the fact that there is much more manuscript evidence for Jesus than for Plato, and the time-gap between Jesus and the manuscripts about Him is far smaller than that for Plato and the manuscripts about him (pp. 81–82). Yet few, if any, historians suggest that what Plato said cannot be known, much less that Plato is a mythical figure.

As for the 'issue' that there is very little non-Christian testimony about Jesus, this means nothing.

> "That's because, as the agnostic New Testament scholar Bart Ehrman points out, we don't have archeological or textual evidence for the existence of *most* people in the ancient world—even most famous people [italics in original]" (p. 9).

### The 'historical Jesus': Ongoing anti-supernaturalist preconceptions

Mainstream biblical scholars have long laboured under the assumption that miracles have no credibility in our modern scientific age. Hutchinson comments,

> "The first quest [for the historical Jesus] was a product of a largely discredited and obsolete nineteenth-century rationalism, yet its assumptions, methods, and conclusions are still widely seen today … . Many of the 'shocking' and 'new' discoveries you read about in weekly news magazines every Easter season are products of the first quest—and thus are 150 years old. The basic assumption of the first quest was: 1. Miracles cannot and do not happen" (p. 47).

In the 20th century, neo-Orthodoxy, the second quest for the 'historical Jesus', became popular among mainline denominations. It rejected the 19th-century optimism about the inevitability of human progress, but retained its rationalism. So have more recent quests. For instance, Mark Roberts, a Harvard-trained New Testament scholar, revealingly says that "If there were no miracles in the New Testament Gospels, then many scholars today as well as many ordinary folk would be much more likely to acknowledge the Gospels' historical reliability" (p. 14).

### The 'historical Jesus': Be skeptical of the skeptics

Hutchinson touches on the various ideas of liberal theologians about who Jesus "actually" was. Modernists variously make Him out to be a deluded apocalyptic prophet, a violent revolutionary, a wisdom sage (effectively a Jewish Socrates), a social reformer and/or community organizer. The author points out that the liberals' ideas are mutually incompatible,

> "What is clear, however, is that all these models cannot be correct. It is implausible that Jesus was both a nonviolent advocate for social renewal in Galilee and, at the same time, a revolutionary plotting the overthrow of the Roman government in Palestine. That, alone, is reason to be skeptical of skeptical scholars; their pronouncements can sometimes seem mutually contradictory. Scholars such as Bart Ehrman and James Tabor insist Jesus was an 'apocalyptic prophet' who expected the world to end at any moment, while other historical Jesus experts—such as N.T. Wright, John Dominic Crossan, Richard Horsley, Luke Timothy Johnson, and Marcus Borg—insist that simply isn't true" (pp. 67–68).

Having read this, I could not help but recall Napoleon. He reputedly said, "Man will believe anything, as long as it's not in the Bible."

### Reliability of pre-NT oral and written tradition

The standard skeptics' line goes like this: the disciples made up a whole bunch of tales about the actions and teachings of Jesus. These tales circulated around, were freely changed according to the whims of those who promulgated these tales, and then eventually compiled, by redactors, into the Gospels. These were written decades, even centuries, after the events, and retroactively attributed to the Apostles. The most extreme exponent of this view was Rudolf Bultmann, who would have had us think that the NT is so saturated with *kerygma* (church teaching) that virtually nothing can be known about what Jesus said and did.

Hutchinson brilliantly demolishes every single link of the skeptics' chain of reasoning!

To begin with, the transmission of oral tradition, in both Jewish and Hellenistic cultures, was done very carefully and with great attention to fidelity. It was not something in which its practitioners 'made things up' or 'changed things'. None other than Paul describes the scrupulous transmission of information. He uses the Greek word *paradidomi* for 'handing on' a tradition and *paralambono* for 'receiving a tradition', and moreover maintaining it precisely (1 Corinthians 11:2). New Testament scholar Richard Bauckham testified about the fidelity of oral tradition embedded in the NT, as exemplified by the thoroughly Petrine perspective found in the Gospel of Mark (p. 36).

Nor is it true, at least necessarily, that the first recollections of Jesus' teachings and actions were solely dependent upon oral tradition. Hutchinson presents evidence that, contrary to common intuition, the geographic area in which Jesus lived was relatively advanced in terms of literacy. It is more than likely that much of what Jesus said and did was written down while He was still alive, or shortly thereafter (p. 33, 165).

The Pauline epistles, which were written in the 40s and 50s AD, are instructive in terms of the significance and reliability of oral tradition. Many scholars find, embedded within the epistles, early sources (hymns and sayings of Jesus) that go back to His lifetime, or shortly thereafter. Both conservative and liberal scholars generally agree that Paul wrote at least the following books: Romans, 1 and 2 Corinthians, Galatians, Philippians, 1 Thessalonians, and Philemon (p. 11).

## Early dates for the Gospels

Hutchinson points out that, owing to the stability and careful transmission or oral and written tradition about Jesus, the Gospels are not diminished in authenticity even if they were written relatively late. Having said this, the author overturns the arguments for late dates for the Gospels.

According to fairly standard thinking, the Gospels were written several decades after the facts. These late dates are indicated by the prediction of the temple being destroyed, which means that it had already happened when the Gospels were written, and the Gospel authors imaginatively had made a prophecy out of an already-transpired event.

Hutchinson challenges this customary reasoning, but does not accept the alternative idea—that the destruction of the temple had been supernaturally revealed before it happened. Rather, he suggests that the Gospel writers, using human reason alone, correctly deduced, decades in advance, that the Romans would eventually destroy Israel and the Temple. It's also incongruous that Matthew, who often appealed to fulfilled prophesy, would *not* have mentioned the temple's destruction as a fulfilment *if* he had written after the event. He also offers the novel suggestion that the 'abomination of desolation' refers not to the destruction of the temple, but to the attempt by the Emperor Caligula, in about AD 39–40, to erect a statue of himself in the temple (p. 30).

The author adheres to the usual view that Mark was the first-written synoptic Gospel, and that the other synoptics were partly copied from it. It is therefore especially significant that, according to British New Testament scholar James Crossley, Mark may actually have been written within five or ten years of Jesus' time on Earth, and not decades after Jesus (p. 29).

The Gospel according to John is customarily regarded as the last written, the most theology-laden, and the least likely to transmit factual information about the life and teachings of Jesus. Contrary to this, scholar Richard Bauckham supports earlier scholars, such as F.F. Bruce, who stress the intimate details of Palestinian geography in the Johannine Gospel. Clearly, the author of John was an eyewitness to the events, and was no imagination-driven 'theologian-storyteller'. He was very much aware of, and very much solicitous about, presenting accurate information (pp. 5, 37). That John was an eyewitness is also supported by Israeli archeologist Rami Arav and non-conservative Jesus-Seminar fellow John Rousseau (p. 5).

However, the foregoing does not necessarily mean that Hutchinson supports the traditional authorship of the Gospels. For instance, he speculates that the Gospel according to John may not have been penned by John himself, but by a later author who had incorporated John's teachings (p. 32).

## The suffering and divine Saviour

According to standard modernist thinking, the Jews at the time of Christ expected a military messiah, and had no concept of a suffering messiah. The early followers of Jesus, unable to deal with the reality that their leader had met His end, moreover in a shameful and horrible death by crucifixion, retroactively invented the idea, and later doctrine, that His death was salvific, that He rose from the dead, and that He was divine.

None other than some Jewish scholars, cited by Hutchinson, soundly demolish the foregoing modernist line of thinking. Israel Knohl and Daniel Boyarin show that some Jews in Jesus' time *did* expect a suffering messiah (p. 120). In addition, the belief that Isaiah 53 referred to such a messiah was already then part of Jewish thinking, and not a later, contrived 'Christian

interpretation' retroactively applied to Jesus (pp. 131, 134).

According to standard notions of millennia-old Jewish thinking, the concept of a God-Man is utterly foreign to Judaism, and God can be only one Person. Thus the contrary belief, that Jesus is God, was invented by the Church long after the time of Jesus, and moreover was taken from paganism. This is manifestly incorrect. Daniel Boyarin shows that the Jews of around Jesus' time were experimenting with 'binitarianism', wherein the Godhead consisted of two divine powers of equal substance and power (p. 133). The most famous was probably Philo Judaeus, who had a concept of the *logos* (cf. John 1:1–14) that he called 'a second God' while affirming monotheism. In fact, Boyarin, and Peter Schaefer, a secular scholar, affirm that Jewish concepts of the nature of God, in the Second Temple period, could well have accommodated views of Jesus being semi-divine or even divine (p. 259).

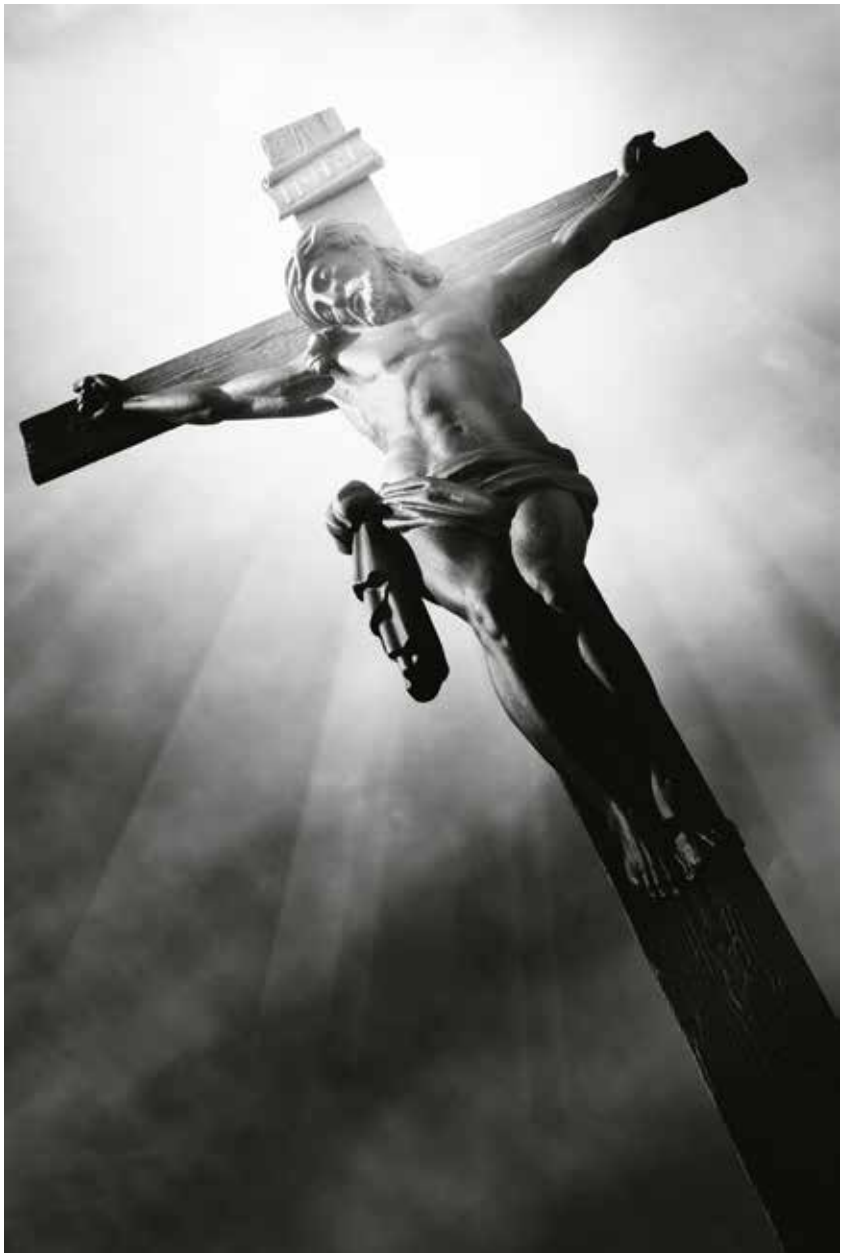


**Figure 1.** The claims of Jesus Christ, including the Resurrection, were very much susceptible to public scrutiny, and would hardly have been promoted had they been untrue.

For the longest time, modernists taught us that Jesus was a more-or-less ordinary religious teacher, and that the belief in the Deity of Christ was a gradual and much later invention of Christians. Scholarly attempts to unravel different successive 'strata', in the evolution of theological thinking in the NT, have demonstrated the exact opposite! Hutchinson quips,

> "But as they pored over these very early traditions, creeds, hymns, sayings, and stories, scholars made an astonishing, even unsettling discovery: It was the very *earliest* stages of the Jesus tradition, not the latest, that spoke of Jesus in grandiose terms as a kind of Jewish God-man. Contrary to everything that they had been taught and believed, it looked as though it had been the Jewish followers of Jesus who proclaimed him 'son (*sic*) of God' and 'standing at the right hand of God', not the pagan Gentile followers who joined the movement in the final decades of the first century [italics and *sic* in original]" (p. 256).

## Jesus argues with the Pharisees

Liberal theologians would have us believe that the conflicts between Jesus and the Pharisees, elaborated in the Gospels, were made up by the early Christians and retroactively applied to Jesus. These Jesus–Pharisee conflicts were purportedly invented in order to heighten the distinction between Christianity and Judaism, and to serve as an anti-Semitic weapon against Jews and Judaism.

Rabbi Shmuley Boteach did a careful analysis of the argumentation used by Jesus in the Gospels. It shows that, far from being an uneducated peasant, Jesus had a very sophisticated

understanding of rabbinic reasoning (p. 144). This sophistication also argues against claims that Jesus' arguments with the Pharisees were some kind of retroactive church-invented polemic against Judaism. It is therefore yet another line of evidence for the factuality of the Gospels.

### Lost Christianities?

The notion has gotten some popularity wherein there were many different early forms of Christianity, and the Christianity usually understood today was the one that happened to win out and suppress all the others. The author thinks that suppression is possible, but cannot be demonstrated. His reasoning is unclear. Since Christians did not have the political power to even potentially outlaw other religions until at least the time of Constantine, three centuries after Christ, how could they possibly have suppressed the so-called alternative Christianities?

Hutchinson unambiguously supports the fact that 'alternative Christianities' were late developments—in the second, third, and fourth centuries (p. 43). In no sense were they serious alternatives to conventionally understood Christianity. The author takes this further,

> "The consensus seems to be that the Gnostic texts merely restate sayings by Jesus already found in the much earlier canonical Gospels and modify them to fit their own philosophical speculations. This means that study of the Gnostic texts teaches us a lot about Gnosticism but very little new about Jesus or his message. … After three centuries of relentless scholarly digging, more and more scholars are concluding that our best resource for learning about Jesus and his message is still, by far, the canonical books of the New Testament" (pp. 174–175).

The 'alternative Christianities' construct, though not mentioned by Hutchinson, boils down to semantics—the very definition of Christianity. Liberals have deliberately made the term so vague that virtually any sect whose teachings overlap with mainstream Christianity, even superficially, is, in their imagination, a 'lost Christianity' or 'alternative Christianity'. (Of course, this also applies to the present. Is Mormonism a modern form of 'alternative Christianity', or is it better understood as a different religion?)

### The first Easter

The author goes over many of the arguments for and against a bodily resurrection of Jesus Christ. He cites the dissident Catholic theologian Hans Küng, who objected to what he saw as both the pat answers of orthodoxy and the equally pat answers of twentieth-century rationalists (p. 248).

Hutchinson dwells on what he supposes is the biblically ambiguous nature of the Resurrection itself. Was it spiritual or physical? In support of this ambiguity, he cites the difficulties that Christ's followers had in physically recognising Him, the repeated and ongoing doubts about the reality of His appearances, etc. Hutchinson's reasoning is fuzzy here. To begin with, a bodily resurrection could only be an unusual and overwhelming experience for those who experienced its consequences. Why, then, would it be surprising that His disciples did not know how to deal with it, experienced conflicting feelings, and cyclically struggled with denial and doubt? On the other hand, if Christ's 'resurrection' was non-physical, what would there have been to struggle about?

If the 'resurrected Christ' were actually a vision, it would not have been an unusual, much less earth-shaking, experience. In addition, this would not adequately explain the many different reports of Jesus being seen alive, much less the observations of His physical body and the empty tomb (pp. 250–251).

Unfortunately, Hutchinson seems to miss the essential point about 'spiritual resurrection'. Any 'resurrection' that does not involve a physical body is really no resurrection at all. Belief in a 'spiritual resurrection' is essentially the same as belief in life after death. That belief was almost universally held to be true of everyone, and therefore unremarkable. In no sense would it specifically be applicable to Jesus Christ.

In the end, Hutchinson acknowledges the complete inadequacy of all explanations apart from the literal bodily resurrection of Jesus Christ,

> "Is it historically credible that Jesus' followers would proclaim that Jesus is alive and risen after death—if the followers themselves and the people to whom they were announcing this shocking news all knew that Jesus' bones lay buried in a tomb in south Jerusalem?" (p. 250).

### Conclusions

This is one of the most interesting books that I have read in a long time. Having read and reviewed numerous books, I do not say this lightly. There is much that the reader can learn from it.

More and more evidence is now showing the NT to be factual. What's more, an increasing number of liberal and atheist scholars are coming around to this position.

# Empirical data support for seafloor spreading and CPT

I enjoyed the latest *J. Creation* **30**(1) as usual, and would like to make comment on an overview by Timothy Clarey for a response by him or any one else who feels qualified to comment.

I agree with the majority of the article but want to comment on the timing of the event—particularly referring to figure 4 in the article, which shows the correlation of the families of oils and their similarities between Brazil and West Africa. My comments and deductions from this are that maybe the Catastrophic Plate Tectonics (CPT) event occurred after the Flood as the geology that formed the oil is most likely to have come from the Flood and therefore seems to have happened before the splitting of the continents. There is, I believe, evidence in the sedimentary layers of both continents that it maybe happened either late in the Flood or after the Flood. Further evidence would need to be gathered from the geology of these areas about which layers were continuous through these regions and which ones may have been deposited after the continental split occurred.

I do not know the details of the timeline of how CPT occurs and whether it would be possible for it to initiate in the oceans and cause flooding over the whole earth before continental separation happened, and whether there would be a gap of at least six months to allow enough time for sedimentation and consolidation to precede the continental separation. The other thing to be considered is whether the newly formed sediments would have slumped and deformed when splitting occurred. This is likely to have been when fine grained layers with some water still in them were split before they became solidified. However, the evidence for this may be concealed by subsequent erosion, unless the slumping happened over a large area. If the sediments were soft, they would have been very susceptible to erosion anyway.

If these investigations showed that CPT could only occur after, or in, the very late stages of the Flood, then we would still be looking for a trigger for the Flood, but it would not mean that CPT did not occur, but just that it may have happened as a result of instability that had been caused by the Flood, rather than being the causal agent.

The other thing that seems to me to have happened mostly after the Flood is the large amount of volcanic activity. Certainly some happened during the Flood, but there was likely, to my mind (without doing an actual investigation, which may prove me wrong), a large amount continuing on immediately after the Flood judging by the presence of volcanic layers on top of the sedimentary layers.

If anyone knows of information that would shed light onto any of these matters I would appreciate your input.

Ralph Bazley
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» **Timothy L. Clarey replies:**

Although I appreciate the comments on my Catastrophic Plate Tectonics (CPT) article,[1] I respectfully disagree with most of the conclusions of the author. This disagreement is not a battle of worldviews, as claimed, but one of data selection and selective data filtering on their part as much as anyone. There are only two worldviews, acceptance of God's Word as truth and everything else (including secular humanism). I think nearly all young-earth creationists would agree God's Word is true, the Flood was global, the earth is young (~6,000 years old), and creation occurred in a literal six-day week as described in the Bible. Since we are in agreement on the absolute truth of God's Word, this is not really a battle of worldviews. We all start with the Bible, contrary to the claim in their comment above.

Unfortunately, the comments made by the author follows the same format as most critiques of CPT, filtering out the vast majority of the data in support of plate movement and avoiding the major data sets that support CPT; instead, concentrating on relatively minor unresolved issues, and/or offering little in a viable alternative to explain the observable data.[2]

I especially take issue with what I see as a rather flippant assertion that the data sets discussed in my original paper are historical and not empirical.[1] The author's judgment that my data sets are faulty and untrustworthy surely can only have been arrived at by filtering my data through his own bias. All six types of data sets presented in my original paper are repeatable, observable, and empirical and not merely historical as this author contends. Anyone can go out and take temperature measurements of the ocean crust across the ridges and get the same pattern in support of seafloor spreading as presented in the geologic literature. Anyone can collect oil samples from offshore Brazil and West Africa and get the same chemical matches across the Atlantic Ocean. Anyone can map the ocean bathymetry and get the same results showing the presence of elevated ridge systems in every ocean. Anyone can tow a magnetometer across the ocean ridges and get a consistent and identically symmetrical reversal pattern on each side of the ridge. And anyone can collect seismic data across the ocean trenches and observe subducted ocean lithosphere extending downward into the mantle to a depth of about 700 km. These data sets are all independent of time constraints, repeatable, observable,

and give consistent results again and again. How is this merely history?

The rapid plate movement rates in the past may be historical, but the present-day patterns observed in the rocks and reflecting this past movement are empirical, especially since the Flood event was not that long ago. The Flood was a historical event that happened once in the past, but much empirical evidence exists that confirms it was reality.

The so-called trump card in all this disagreement is the mantle tomography data, which plainly shows subduction of ocean lithosphere. Examination of the data shows uninterrupted and continuous ocean lithosphere at the surface, bending and extending downward into the upper mantle.[2] Similar mantle tomography data have been collected across nearly every subduction/trench system in the world. The results are always the same. How does the above author explain all of these data? By crafting a weakly documented claim that these data are 'interpreted' images. But in reality, there is little leeway in the velocity models that produce these images. Like any seismic data, geophone receivers are spread out, a source of energy produces elastic waves that reflect and refract off differences in density and velocity in the internal earth, and the return signals are recorded and processed by computer. A well-constrained velocity model produces the images we see in the literature.[2,3]

How are tomographic results tested empirically? Firstly by repetition and secondly by plotting earthquake foci beneath the ocean trenches (the Benioff Zone). Foci clearly plot along and within the subducting slab, confirming the correct depth and angle of the lithosphere in the mantle.[2,3] A similar process is done nearly every day in the search for oil and gas. Oil wells verify that these seismic images are correctly constrained spatially and in depth. Seismic data, and tomography, is tested empirically. There is very little difference in the results even if the velocity model differs from try-to-try or place-to-place. All reasonable velocity solutions give the same result. Ocean lithosphere is clearly observed to have been subducted at trenches all over the earth.

In his comment above, the author never adequately addressed the mantle tomography nor many other data sets that fully support CPT, including providing an explanation for the unique magma chemistry observed above subduction zones and the earthquake epicentre patterns that delineate the plate boundaries.[1] These data are still best explained by seafloor spreading and plate movement as discussed previously.[1,2] As I've asked before, where is the alternative model that explains all these data?[2] Simply claiming data is not empirical is avoidance of the real issue.

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## Examining the floating forest hypothesis: a geological perspective

In reference to Dr Timothy L. Clarey's difficulties with a floating forest being responsible for Carboniferous coal deposits,[1] perhaps his understanding of it is at fault. He does not reference Dr Otto Kuntze, who discovered it and has written many times more on it than all other researchers combined. He suggests going back to the "floating log mat model put forth by Austin", not crediting Kuntze's more extensive observations done a century before him or realizing such observations were what helped create the model in the first place. His list of considered alternatives just does not have any field evidence to suggest it.

The one quantitative calculation in his article is irrelevant when considering such things as the impermeable layers in coal measures observed by Joanna Woolley, who is referenced by him. Lycopod bark barriers are just one of many explanations as to how perched water tables could conceivably have existed in the pre-Deluvian floating forest. Furthermore, when Kuntze observed a contemporary floating forest analogue floating down a South American river in the 19th century, he made no mention of peat or homogeneity, the assumed characteristics used by Clarey.

If one were to use the observed circular spread of the lycopod root system, then it would be reasonable to assume circles representing a layer of lycopods had been as densely packed as mathematically possible. If this were the case, then there are spaces where trunks from lycopods in a lower identical layer could have penetrated the first layer. In fact, there are exactly three, and only three, identical but offset layers that could be in a combination where all the lower trunks could penetrate all the spaces. This might argue for a three-layered floating forest.

Clarey uncritically accepts such geological concepts as the existence of cyclothems. In a most interesting and well-reasoned article, several authors have mathematically proven that the supposed repetitive sequences dubbed cyclothems do not exist. These authors examined the nearest thing to a type locality site for cyclothems

and showed that Markov analysis would not exclude the null hypothesis regarding the existence of repetitive layers. As they state: "Although we may hope to derive some more 'meaningful' interpretation of these lithofacies successions, at cyclothemic scales of consideration, there simply is no story to tell."[2]

Using Kuntze's silvomarine theory, the lack of statistical evidence for cyclothems can be explained. The explanation lays in the existence of clustered groups of *thin* coal beds, always *three* in number. They skewed the analysis. Properly treating them allows cyclothems to exist under rigorous mathematical inquiry. It also confirms the expected triple-layer nature of the floating forest. However it does more than that.

The existence of thicker beds argues for floating forest layers that were not yet broken up. (The not uncommon occurrence of splitting coal seams argues for floating forest layers in the process of being split up.) These negate a good part of Clarey's conjectured qualitative objections to the silvomarine hypothesis.

Catastrophic, or fast plate, tectonics has as its weakest point the treatment of continental sedimentation. If we are considering a global Flood on a spinning earth, then we should expect non-linear physical phenomena to appear.[3] I do not yet see that level of modelling sophistication in any effort concerning plate tectonics, and I suspect there will be unexplained phenomena requiring modifications or the complete scrapping of some aspects of current fast plate tectonic work. The 'fast' aspect of such models implies elastic wave phenomenon. We might have evidence of this.

The shape of a coal basin on the western flank of the Appalachian Mountains (eastern USA) has been modelled.[4] Despite difficulties, the modellers were on to something. The physical implications of using a plate equation of *motion* for the asthenosphere to model a coal basin are obvious. At one point the asthenosphere must have been propagating an elastic wave.

Using a plate equation of motion appropriate for the known physical properties and thickness of the asthenosphere,[5] there is no need to fudge the data line for modelling the coal basin shapes or their spacings on the entire North American continent east of the Rocky Mountains. Agreement is obtained: it appears there was a resonance of the asthenosphere between the two probable free ends of the Appalachian and Rocky Mountains. (One end could possibly be a forced end.)

This resonance would explain the coal basins in New England having multiple turbidites, maceral plumes, unusual anthracite coal chemical composition, and fragmentary lycopod fossils. The pieces of the floating forest were being periodically spilled over the top of the Appalachian Mountains (the eastern end of the continental resonant basin). A criticism of the catastrophic tectonic plate work would be that these and other geographically extensive and in-depth observations have not yet been incorporated into it or derived from it. I cannot conceive of the runaway subduction of any plate not coupling with an adjacent non-subducted one, perhaps with the adjacent plate reacting in a repetitively rebounding fashion.

Finally, I fully agree with Clarey about his floating forest being a 'phony forest'. Any continent-fringing, terrestriality-exhibiting, peat-laden, single-layer, easily dissociated floating Carboniferous forest is thoroughly phony in regards to the aggregate whole of the preceding list of characteristics or any of its components. Just how does this relate to the silvomarine hypothesis of Kuntze, Scheven, and Woolley?

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### » Timothy L. Clarey replies:

In response to the above comments, I would like to emphasize that my initial paper critiquing the floating forest hypothesis was merely to examine it from a geological perspective.[1] It was not meant to be a comprehensive analysis of coal formation during the Flood year. Admittedly, I did not include a detailed history of the floating forest or silvomarine model, including the work of Otto Kuntze, in this paper as it was not the objective. However, I have co-authored another paper that details the history of the floating forest, and the work of Kuntze, that is forthcoming.[2,3]

The above author argues there is a lack of field evidence to support the allochthonous origin of coal as I perceive it, but where is the field evidence to support a continent-scale floating forest biome? The best field evidence for the origin of all Flood coal comes from Steve Austin and his work on the floating log mats torn loose during the 1980 eruption of Mt St Helens.[4] This is precisely the type of coal-forming alternative I am proposing. For the record, I do believe in the allochthonous origin of coal, but not from a pre-Flood floating forest biome.

My second response deals with the criticism of my permeability analysis of a floating forest biome. This calculation was a best estimate

of the hypothesized biome substrate at the time of plant growth. I don't see it as appropriate to compare this permeability estimate to the coal and surrounding sedimentary rocks found today. One cannot compare the permeability of unlithified peat and bark with that observed in modern rocks. They are totally different. And there are very few things that can be called impermeable layers, even in coal measures. All rocks and sediments and intertwined tree roots 'leak' fluids, some faster than others, obviously.

Third, the argument that thicker coal beds imply floating forest layers that were not broken up is surely falsified by the thicker coal seams found in the Powder River Basin, Wyoming and Montana, USA, where they commonly exceed 30 m and are even over 60 m in thickness. These coal seams are found in Paleogene (Lower Cenozoic) sedimentary rocks, stratigraphically well above the lycopod-rich coal seams. These coals are not composed of lycopod trees and yet greatly exceed the thickness of most, if not all, lycopod tree coals. Therefore, the source of these coals must be something other than a floating forest biome.

Where the above author has doubts about catastrophic plate tectonics (CPT), sedimentation, and runaway subduction, I encourage her/him to read the papers by John Baumgardner where he addresses the physics behind subduction and his more recent sedimentation modelling.[5,6]

Finally, I consider the most persuasive evidence for CPT to be seismic tomography, showing clear images of oceanic lithosphere subducted into the mantle to a depth of 700 km.[7] These data cannot be ignored or trivialized. Tomographic data are as compelling and concrete as field data. Geophysicists use similar seismic data every day to find oil in the subsurface. Oil wells confirm the seismic interpretations are factual representations of the rocks in the subsurface. How can anyone reasonably doubt these images?

The evidence in support of CPT is so much more than even crust types and sediments. And it requires training in igneous and metamorphic petrology and magma chemistry to be completely understood. Chemical differences in the partial melts at subduction zones and at ridges, and the tomographic studies, are verifying that rapid seafloor spreading and runaway subduction has occurred in the recent past. Because of a lack of exposure to this geologic evidence, many too easily gloss over the tremendous amount of data that support plate movement, including why magmas differ in different locations, and why earthquakes line up where they do along plate edges, and why the deepest earthquakes occur only within subduction zones.

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# Youthfulness of Antarctic ice sheets

I have two comments related to Michael Oard's recent article regarding the lack of erosion beneath the Greenland and Antarctic ice sheets.[1]

First, it is interesting to note that uniformitarians had already claimed years ago to have solved the mystery of the youthful appearance of the Gamburtsev Mountains beneath the Antarctic ice.[2] However, their explanation never seems to have progressed beyond the 'storytelling/hand-waving' stage and did not address the fact that the Antarctic ice sheets would have been warm-based for much of their history, as Oard pointed out.

Uniformitarians have since devised a new, completely different explanation: supposedly basal heat melts ice in deep valleys under the ice to form lakes and rivers. This water is then pushed uphill over the mountain tops by the pressure of the overlying ice. Because of colder temperatures within the ice far from the bedrock, this water freezes, providing a protective layer that supposedly protects the mountains from erosion.[3,4] Clearly, the simplest explanation for the lack of erosion in these mountains is that the ice sheets are young, and my suspicion is that this newest 'explanation' is more 'hand-waving'. However, it would be prudent to carefully examine this new argument, as biblical skeptics will surely bring it up if we attempt to use this lack of erosion as a recent-creation argument.

Second, Oard makes another argument for the youthfulness of the ice sheets, also presented in his technical monograph *The Frozen*

*Record*, which I do not really understand.[5]

He argues that isochronous layers within the ice sheets, revealed by ground penetrating radar, is another evidence for the youthfulness of the ice sheets, because hills and troughs within these isochronous layers 'line up' vertically with corresponding hills and troughs in the underlying bedrock. Oard argues that this would not be the case if the ice sheets were millions of years old, as shearing within the ice would cause these vertical lines to 'curve' forward, so that corresponding hills and valleys within the layers would no longer lie directly over the their corresponding topographical features.

However, it is not clear to me that this would be the case, and hopefully the accompanying illustrations will show why. Imagine that you could take a giant knife and slice open the Antarctic ice sheet, like a birthday cake. Imagine also that these isochronous layers are visible, as are their corresponding topographical features within the underlying bedrock. Suppose one were to take a giant can of spray paint and paint a prominent vertical line above a given location within the ice, say at $x = 0$ (figure 1). Shearing in the ice may very well distort this vertical line over time (figure 2), but one can imagine that the undulations within the ice would *still* lie above their corresponding topographical features within the bedrock. In other words, I don't think any possible depth-dependent horizontal velocities of the *undulations themselves* necessarily equate to depth-dependent horizontal velocities of tiny parcels within the ice. They may very well move at different speeds. In fact, I have a very hard time even visualizing a scenario in which the undulations themselves are horizontally displaced (however, the problem may very well be with me!).

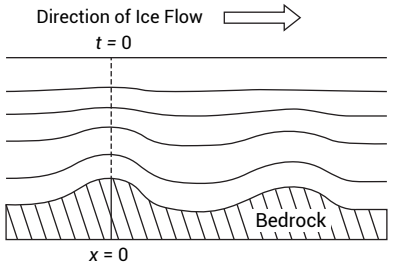


**Figure 1.** At time t = 0, an imaginary vertical line is drawn that connects undulations in isochronous ice layers with the corresponding undulations in the bedrock topography. Undulation heights exaggerated for clarity.

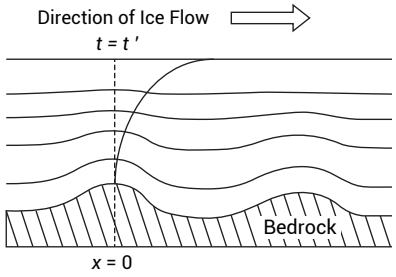


**Figure 2.** At some later time t = t′, shearing would cause this line to be distorted, as horizontal ice velocities are faster near the surface. However, the undulations themselves could conceivably remain in their original locations. The precise mathematical shape of the distortion would depend upon the assumptions within the particular ice flow model being used.

I think Oard's argument may be valid in principle, but I don't see how we can make it without some kind of clear vertical 'reference' line against which we can judge relative depth-dependent motions of parcels within the ice, and unfortunately, giant spray-painted vertical lines within the ice don't exist!

Also, I have done a little reading on this and I get the impression that shearing within the ice is a rather complicated topic, and I personally would be hesitant to make this argument without a *lot* more analysis.

I commend Oard for pointing out additional potential arguments for the youthfulness of the high-latitude ice sheets, but it may be a little premature to use these arguments, especially the second one (shearing within the ice) until more study by creationists has been done in this area.

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### » Michael Oard replies:

I thank Jake Hebert for his compliments on my article on the bottom profiles of the Greenland and Antarctic ice sheets showing little erosion. The uniformitarian suggestion of a layer of ice pushed up from subglacial lakes to coat the lower slopes of the remarkably preserved Gamburtsev Mountains under the Antarctic ice sheet seems possible.[1] This of course is only plausible once there is a thick cover of ice that would become warm-based with meltwater.[2] The Gambrutsev Mountains show seismic evidence for mountain glaciation, such as cirques, which should have eroded the mountains at the beginning of buildup during hundreds of thousands of years. Mountain glaciation and periglacial processes are efficient at eroding

bedrock.[3] Also, such refrozen melt also had to survive the late Oligocene and Miocene Climatic Optimum. Within the uniformitarian system, there should have been abundant pre-glacial erosion.

The second question relates to the isochronous layers being vertical and reflecting the bottom profile of the ice sheet, as shown by the author's figure 1 and in my monograph on the ice cores on the ice sheets.[4,5] It is difficult to understand the argument for youth from these isochronous layers, one reason being that uniformitarian scientists believe the ice sheet has been at generally the same thickness for 14 Ma, although they have drilled down to about 100 m above bedrock in the Dome C core with an age of only about 800,000 years.[6,7] So, most of these millions of years are supposedly in the bottom 100 m of ice, which is probably deformed.

So for 800,000 years, the isochronous layers must start from the surface, as volcanic ash layers, and move vertically down with a horizontal component as the ice moves, sort of like the author's figure 2, which would depend upon the particular deforming layers and the amount of time of deformation.[8] Ice streams, defined as streams of ice moving at more than 800 m/yr, drain 90% of the Antarctic ice sheet.[9] The other 10% is slow moving, but still there would be a horizontal component to the isochronous layers in these layers. If the ice of slow-moving areas moves about 3 m/yr, a conservative value, at 800,000 years the layer 100 m above the bottom would have moved 2,400 km, if all movement was by basal sliding, which should occur with warm-based ice. The layer, say at 400,000 years would have moved 1,200 km. So, in hundreds of thousands of years timescale, it seems like there should be significant distortion of the isochronous layers. The near-vertical line in the author's figures 1 and 2 should become nearly horizontal over hundreds of thousands of years.

Otherwise, the straightforward impression is that the snow quickly accumulated over a short period of time. For there to be no change in the vertical profile of the isochronous layers for 800,000 years, the flow of ice would have to always run through a stationary wave, up and over mountains. This seems unlikely to me (of course, it could be that I am looking at the uniformitarian view wrong).

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# Empirical data support for seafloor spreading and catastrophic plate tectonics?

We are grateful for the article by Dr Clarey defending Catastrophic Plate Tectonics (CPT) as an important concept in biblical history.[1] The exchange (and defense) of ideas is critical as we work together as Christians in defining biblical geologic history.

Clarey asks an insightful question at the close of his introduction:

> "Are we to ignore all scientific papers put forth by non-Christians and only accept research by scientists holding our own worldview?"[2]

We believe this is the *most important* question facing young-earth creation science today.[3]

### Establishing a worldview

Clarey does not seem to understand the three competing worldviews (i.e. naturalism, naturalistic remodellers, and biblical reconstructionists) in creation science. While young-earth creationists are Bible believers, much of their biblical geologic history is derived from extrabiblical sources built on a foundation of naturalism.

Recently, an effort to unify Scripture and naturalism has been offered by several young-earth creationists through converting/shifting/compressing naturalistic geologic concepts (figure 1). This perspective is being promoted by naturalistic remodellers.[3] The 'conversion' of some of these ideas has developed to become CPT, accelerated radiometric age-dating, and time

compression of the standard geologic timescale.

Other young-earth creationists have called for a reconstruction of all geologic sciences through a biblical worldview (figure 2). This is the perspective of biblical reconstructionists.[3] Clarey laments that for reconstructionists "only a generalized timescale has been developed … and details from the vast majority of site-specific locations are still lacking".[2] He cites only one reference in defense of this statement. This is unfortunate because numerous articles (and a book[4]) have been written by reconstructionists applying the biblical geologic timescale at many different locations across the United States and Australia.[5]

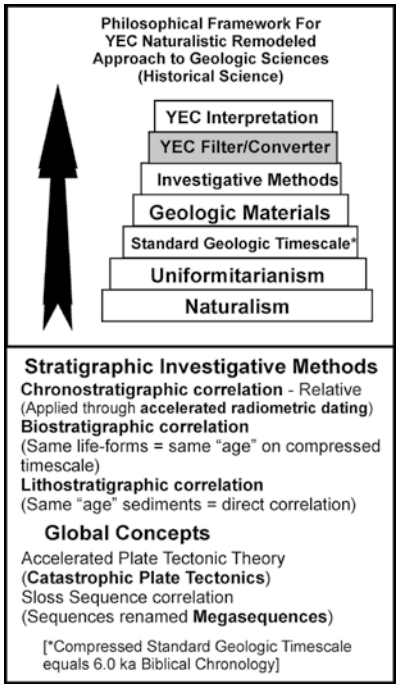


**Figure 1.** Remodellers accept (either knowingly or not) the philosophic worldview of naturalism in support of a time-compressed standard geologic timescale. The timescale is renamed a geologic column and is viewed not as conveying absolute but relative time within the 6,000-year Earth history. It still follows the Precambrian-to-Holocene time progression. Most importantly, the Remodellers apply a young-earth creationist (YEC) filter to the naturalistic geologic concepts and methods that conforms them to a biblical framework. But this often creates problems that require 'miracles'. The three investigative stratigraphic methods are adjusted but remain consistent with the time-compressed standard geologic timescale. This worldview follows evolutionary progression, but in a time-compressed manner, and would support biostratigraphy defended with naturalistic datasets.

Does the reconstructionist approach require the rejection of all work conducted under naturalism or by remodellers? The answer is no. Young-earth creationists need to retain and use the physical data but remove all naturalistic interpretation.[6,7]

## Clarifying the two 'types' of science

Clarey claims there are empirical (i.e. observed and scientifically testable) data supporting seafloor spreading and CPT, including: 1) heat dissipation moving away from oceanic ridges, 2) elevational drop of the oceanic crust moving away from oceanic ridges, 3) matching magnetic reversal bands on both sides of a spreading ridge, 4) the presence of ocean ridges, 5) correlation of liquid petroleum (i.e. oil) from Brazil and West Africa, and 6) tomographic images interpreted as showing subducted oceanic crust in the mantle.[8]

Clarey claims that many of these datasets are independent of radiometric age-dating but do they *require* an interpretation consistent *only* with Plate Tectonic (PT) theory and CPT? A technical monograph written by several young-earth creationists has challenged some of these specific empirical evidences.[9] It should be reviewed.

We assert that *all* of Clarey's 'empirical data' are historical. Historical events occurred in the past and are not subject to experience, repetition, or observation (table 1).[10] It is through Clarey's 'PT/CPT interpretation' that he claims observation and experience but this is history and not science.

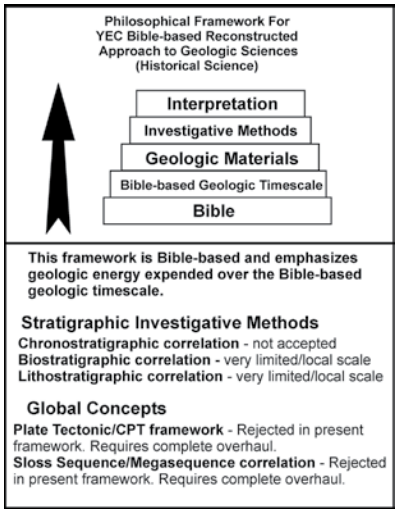


**Figure 2.** This is the worldview of reconstructionists. It completely abandons naturalism, the standard geologic timescale, and all of its inherent evolutionary assumptions. The biblical account of Earth history forms the biblical geologic timescale. It is used to define time and the geologic energy expectations of the rock record. The three investigative stratigraphic methods used in naturalism and modified by remodellers would have limited application in this worldview. God created the entire world in six days with all living creatures living in their respective antediluvian environments. The Flood changed it all. Flood-deposited fossils on one side of the earth would correlate to Flood fossils everywhere. The timing may vary in terms of early, middle, or possibly late Flood, but they would have been deposited during the Flood. This is the reality of reconstructionist Flood-dominated biostratigraphy. Post-Flood correlation of plant and animal fossils could prove fruitful in documenting post-Flood animal/plant/man dispersion/migration. However, that work remains to be conducted.

## Catastrophic plate tectonics—an old idea with plenty of problems

> Clarey cites three recent articles: "Several recent articles have been published in the creation literature that have been critical of plate tectonics (PT), and specifically catastrophic plate tectonics (CPT)."[2]

Searching this subject in existing creationist technical literature[5] would have changed his perspective. Many articles and a book questioning ideas regarding PT/CPT began appearing

in the creationist technical literature in 1996.[11]

## The assignment of 'miracles' in developing a biblical geologic history

Clarey mischaracterizes one of our questions regarding the application of miracles in following CPT:

> "Their claims that the rapid horizontal movement of the plates across the earth requires a miracle, that accelerated nuclear decay requires another miracle, and that *global deposits require another miracle*, are no different than calling on miracles to initiate the Flood as they themselves have done."[12]

We never invoked a miracle for the global deposition of Flood-derived sediments – that would be a physical manifestation of the Flood. We did question the remodellers' claim of global chronostratigraphic correlation since its defense resides in naturalism. We remain perplexed why so many miracles are deemed necessary by remodellers in their defense of CPT.

## The misapplication of figure 2

Clarey surprised us with his uncited figure 2 and caption stating:

> "There is a fairly well-defined general agreement of absolute-radiometric ages and stratigraphic ages."[13]

We have previously discussed this figure with Dr Russ Humphreys.[14,15] The figure was originally used by John Woodmorappe[16] to *discredit* the use of radiometric age-dating by naturalists and to *discourage* its use by young-earth creationists. Its continued use by remodellers to support accelerated radiometric age-dating is inappropriate.

## Missed opportunity

Clarey makes an important statement:

> "Creation scientists cannot pick and choose the empirical data sets they want to use but should include all appropriate data sets in any Flood explanation."[17]

We ask that Clarey apply this to the three objectionable articles he cites but does not address at the beginning of his article.[18–20] These articles use data to raise objections to PT and CPT. We encourage Clarey to publish details of his objections for the three articles so that we can understand the 'appropriate datasets'.

## Conclusion

The schism[3] we identified in creation science is not about the acceptance or rejection of CPT or biostratigraphy, as Clarey's article might suggest. It is developing between opposing worldviews.

We continue to ask remodellers who advocate CPT and other naturalistic concepts (e.g. accelerated nuclear age-dating, biostratigraphy, and the use of the time-compressed standard geologic timescale) to publish and defend their ideas as we have done with ours. We sincerely hope all of

**Table 1.** These are Clarey's six empirical evidences supporting CPT. Each claim is examined based on observation/experience (science), processes that occurred in the past (history), and interpretation. All evidence for CPT is based in history and interpretation. This is a common problem for naturalists and remodellers working in the historical geological sciences; their 'interpretation' drives purported 'science', which is in fact history. Concepts like CPT and PT theory will eventually be replaced by newer concepts as new data overwhelms the old.[21] As such, CPT/PT as geologic concepts, are not essential to development of biblical geologic history.

| Empirical Evidence in Support for Catastrophic Plate Tectonics | Empirical Science (Relying on experience or observation) | Historical (Process occurred in past and was not observed or experienced) | Interpretation |
|---|---|---|---|
| 1. Heat dissipates moving away from oceanic ridges | Heat gradient measurable - origin and cause not observed | The creation of heat at the oceanic ridges occurred in the past - process unknown | CPT did it |
| 2. Elevational drop of the oceanic crust moving away from oceanic ridges | Elevation measurable - origin and cause not observed | Raised elevation occurred in the past - process unknown | CPT did it |
| 3. Matching magnetic reversal bands on both sides of a spreading ridge | Magnetic reversals can be measured - origin and cause not observed | The formation of the magnetic reversal bands occurred in past - process unknown | CPT did it |
| 4. The presence of ocean ridges | Ocean ridges occur - origin and cause not observed | Ridges also occur on Iceland - but formed in past - process unknown | CPT did it |
| 5. Correlation of liquid petroleum (i.e., oil) from Brazil and West Africa | Petroleum deposits occur - origin and cause not observed | Source rocks and petroleum deposits formed in past - process unknown | CPT did it |
| 6. Tomographic images show hot/cold areas in the mantle | Hot/cold areas in mantle - origin and cause not observed | Hot/cold areas in mantle were formed in past - process unknown | CPT did it |

us can work collectively to develop a technically sound and biblically defensible geologic history. To God be all the glory.

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respectively
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5. An excellent young-earth creationist literature resource, provided as a free ministry of Core Academy of Science, can be found at: www.coresci.org/celd/. The search term 'Catastrophic Plate Tectonics' (CPT) turns up nearly two dozen articles, most questioning various aspects of CPT. This website would be an excellent place to pursue further study.
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## Timothy L. Clarey replies:

I would like to address a few of the comments and questions about CPT that were brought up in the preceding letter. First, most advocates for CPT believe movement of the tectonic plates was a major factor in both the initiation of the Flood and inundation of the continents.[1] Therefore, most plate movement is thought to have occurred during the Flood itself and not after. Rapid plate movement after the Flood would have been disastrous for land life as tsunami-like waves would have continued to develop as a result of plate motion.[2]

The uplift of the newly created ocean ridge (Mid-Ocean Ridge) and crust in between South America and Africa is also believed to have contributed to the flooding of the continents. The formation of new crust causes uplift of the seafloor from below and displaces even more water onto the continents.[3] There are differing opinions, however, even among CPT supporters, on whether the plates had ceased moving or were still moving rapidly when the Flood ended. A lot of this depends on where you draw the Flood/post-Flood boundary in the geologic record.

Secondly, I have been gathering substantial amounts of oil well and seismic information on the sediments across North America, Africa, and South America, including the offshore continental shelf regions. Although unpublished to date, the results are beginning to clarify a global Flood sedimentation model. Sediments began to accumulate off West Africa and eastern South America simultaneously as rifting began. These data confirm that the various oil source rocks were deposited after the South American and African continents began to split. And it follows that there was no depocentre for sediment accumulation along the edges of the continents prior to the separation. Africa and South America split fairly late in the rising portion of the Flood (still pre–Day 150), during deposition of Cretaceous system strata. Later plate movement during the Flood further separated these oil source rocks and created more new seafloor in between and placed additional sediment on top of the source rocks.

Finally, I do not see a lot of soft-sediment slumping associated with the splitting of the continents, as postulated. Normal faulting is common on the shelf margins, but very little, if any, large-scale, soft-sediment deformation is observed. Although faulted, the sediment layers seemed to have stayed relatively coherent as deposited. Later widespread sheet-like erosion during the receding water phase (post–Day 150) moved tremendous amounts of recently deposited sediment from the continents out onto these oil source rocks, burying them even deeper and placing them into the oil-generation window.

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# Are creationists talking nonsense on scientific issues?

*Benno Zuiddam*

Augustine of Hippo warned Christians against uninformed statements about science. Theistic evolutionists claim that his warning applies to creationism. A careful examination of Augustine's statement in the context of his book on the literal meaning of Genesis shows that this claim is ill-conceived.

Church Father Augustine of Hippo continues to be a favourite among Christian evolutionists; not only to justify their position, but also to actively condemn traditional Bible believers. Over the last few months I received several requests to respond to a specific passage where St Augustine warns Christians against talking nonsense on scientific issues. This is subsequently applied to those who take the historical claims of Scripture seriously and dare to be outspoken about this. One finds this particular passage on the internet, but also in supposedly academic publications like *The Counter-creationism Handbook*, sanctioned by the University of California Press.[1]

Unfortunately, where targeting creationism is concerned, graciousness does not seem to be a priority. One of my correspondents was actually prompted to read this quotation carefully and realize that it truly applied to him. He was to recognize that believing the historical aspects of Genesis in the 21st century is a dangerous idea that only serves to make Christianity ridiculous.

Interestingly, those who quote Augustine (figure 1) to refute creationism do not necessarily give the impression that they are in the habit of reading Church Fathers or to be guided by them otherwise. Ask the same antagonists whether they agree with Augustine's views on original sin, predestination, paradise as a real historical place on Earth, Eve built from Adam's rib, the age of mankind, and the historicity of Noah's flood as a worldwide event, and it becomes apparent that those who quote Augustine may be missing the point that they are endorsing a Church Father with fundamentalist views. This could suggest that quotations that 'prove' differently are likely to be out of context.

The situation is slightly different among those who, unlike theistic evolutionists, do not claim continuity with the historic Christian faith. Over the last few years it is increasingly understood in non-Christian circles that Augustine is very much at odds with any neo-Darwinist explanation of the history of the earth.[2] As apparently this light has not yet dawned among those who remain committed to the theory of theistic evolution, this contribution examines the famous quotation, its author and context, and concludes with some practical guidance.

## 'Christians talking nonsense'

Usually the famous 'anti-creationist' quotation is presented in English, even in a continental European setting where everyone concerned speaks a different language. This suggests that the original Latin source was not taken up, read, or inwardly digested.[3] Furthermore, to someone familiar with the particular history of Augustine's work in translation, this indicates that only the quotation was read and subsequently put forward to 'refute' creationism. The 'famous' Augustine quotation comes from a book that hardly anyone owns, let alone reads: Taylor's *Literal Meaning of Genesis* (1982).[4]

*De Genesi ad litteram* reflects Augustine's adult ideas about biblical interpretation, preferring literal over allegorical exegesis. Although allegorical exegesis continued to have its legitimate place as a symbolic picture for truths that were found elsewhere in Scripture, it wasn't proper exposition of the meaning of a passage. Augustine's definitive work on Genesis had different false starts and eventually slowly matured over a period of 14 years before it was finished.[5] Until recently it wasn't well known in the English-speaking world because it wasn't available in translation, and Latin skills are becoming scarce. It was rather popular in the Middle Ages, when all scholars read Latin, but until quite recently it was rarely consulted and otherwise only readily available in French. It was eventually translated into English by John Hammond Taylor, an American Jesuit, and published after his death.[6]

The full passage from this book that is supposed to silence creationism reads:

> "Usually, even a non-Christian[7] knows something about the earth, the heavens, and the other elements of this world, about the motion and orbit of the stars and even their size and relative positions, about the

> predictable eclipses of the sun and moon, the cycles of the years and the seasons, about the kinds of animals, shrubs, stones, and so forth, and this knowledge he holds to as being certain from reason and experience. Now, it is a disgraceful and dangerous thing for an infidel to hear a Christian, presumably giving the meaning of Holy Scripture, talking nonsense on these topics; and we should take all means to prevent such an embarrassing situation, in which people show up vast ignorance in a Christian and laugh it to scorn. The shame is not so much that an ignorant individual is derided, but that people outside the household of faith think our sacred writers held such opinions, and, to the great loss of those for whose salvation we toil, the writers of our Scripture are criticized and rejected as unlearned men. If they find a Christian mistaken in a field which they themselves know well and hear him maintaining his foolish opinions about our books, how are they going to believe those books in matters concerning the resurrection of the dead, the hope of eternal life, and the kingdom of heaven, when they think their pages are full of falsehoods on facts which they themselves have learned from experience and the light of reason? Reckless and incompetent expounders of Holy Scripture bring untold trouble and sorrow on their wiser brethren when they are caught in one of their mischievous false opinions and are taken to task by those who are not bound by the authority of our sacred books. For then, to defend their utterly foolish and obviously untrue statements, they will try to call upon Holy Scripture for proof and even recite from memory many passages which they think support their position, although *they understand neither what they say nor the things about which they make assertions*."[8]

The typical theistic evolutionist use of this passage runs as follows: "Apparently Augustine, in his day, had trouble with people who tried to make deductions about the way the world works by assuming that Genesis provided information of a scientific nature."[9] The Bible is seen as merely a book of faith and should not be used differently. In June 2016 a group of scientists in the Netherlands published an open letter along these lines. Its contents are supportive of theistic evolution as an explanation for the universe, and restrict the authority of Scripture to matters of faith and morals.

> "Christians believe that God stands at the beginning of the Cosmos and that he has a daily involvement with this world. The scientific view of a world that is billions of years old does not undermine the authority of the Bible at all, nor does an evolutionary development of life on earth. Within its parameters science provides insight into exactly how origins and developments took place. The Bible speaks in a completely different language about the origin of the world and the human race and mostly concerns itself with giving reasons and purpose; it isn't a book of science, but a message of hope and grace."[10]

Of course this approach is rather different from that of the Church Fathers and of the doctors of the church in the thousand years of Western civilisation that followed them. Until the Enlightenment, Christian scholars in all fields, Augustine included, took the historical aspects of the books of Moses very seriously.

## Author and book

What is bewildering in critical publications such as *The Counter-creationism Handbook*, is that scholars who quote Augustine so confidently in favour of evolution do not seem to realize with whom they are dealing. Why not? Because the Church Father was not a transformist. He did not believe in gradual transformation of one species into another by descent with modification through many generations.[11] Like many scientists of his day, he probably accepted *abiogenesis*, spontaneous generation. Augustine might be used for a theory of theistic evolution that does not build on transformation, but neo-Darwinism is firmly outside this category.

It is equally noteworthy that those who quote the passage do not seem to realize that they actually cite from an

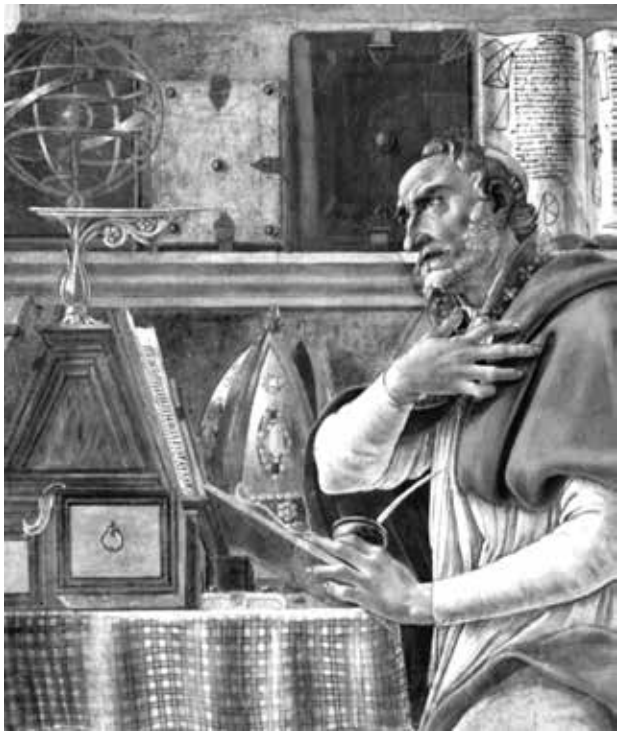

**Figure 1.** St Augustine of Hippo

otherwise extremely fundamentalist book by an author who argued that mankind is only a few thousand years old, and who preferred God's revelation to Greek scientific theories of origins any day.[12] Augustine believed both creation stories in Genesis to be factual. He also firmly believed that Moses was the one human author of the Pentateuch.[13] That Augustine remained a biblical literalist until the very end of his life, is clear from his *Retractiones (Revisions)*.[14] In retrospect he affirms that his specific goal with the *Literal Meaning of Genesis* was "the proper assessment of what actually happened".[15]

Merely a look at secondary sources, should make one cautious about quoting Augustine to refute creationism. That this Church Father was committed to biblical literalism is by no means a novel observation. Twenty five years ago, Eileen Reeves wrote on Augustine and Galileo:

> "In the De Genesi ad Litteram, Augustine had insisted upon the importance of the literal meaning of Scripture, and he had argued its preeminence largely at the expense of two other modes of interpretation. The first type involved allegorical readings; and though these were valid in that they usually told, in symbolic terms, the story of man's eventual salvation, Augustine believed that they might be proposed only when all efforts to establish a literal reading had been exhausted."[16]

A quick glance at a secondary source like this suggests that Augustine might not be the right author for finding fault with Bible believers. A book that prefers a literal interpretation of almost anything in Genesis is unlikely to produce quotations that undermine this idea. If it seems to do so, such statements are likely to be taken out of context. Someone truly interested in this Church Father, and not merely hunting for the odd quotation, would have appreciated and practised Augustine's view that the ideal reader knows the whole book.[17]

## Quotation in context

After the character of a source, it is also helpful to consider the linguistic side, or the 'direct textual context' of a passage. It is quickly established that in this passage Augustine is not making a general statement about the nature of the alleged events in Genesis. Quite the contrary, he provides guidance to his readers on how *obscure places* in Genesis should be treated.[18] His point in context is: Where the meaning of a passage in Scripture is not clear, Christians should refrain from offering their ignorance in scientific matters as a surrogate interpretation of the Bible. Those who try this make themselves ridiculous in the eyes of anyone who has basic knowledge about the universe. What is worse, it also reflects badly on the biblical authors and keeps infidels from believing the Scriptures:

> "If they find a Christian mistaken in a field which they themselves know well and hear him maintaining his foolish opinions about our books, how are they going to believe those books in matters concerning the resurrection of the dead, the hope of eternal life, and the kingdom of heaven, when they think their pages are full of falsehoods on facts which they themselves have learned from experience and the light of reason?"[19]

Augustine instils respect for Scripture and for the truth. If the meaning of a passage is unclear, it is inadvisable to deliberately seek an interpretation that goes against the facts of life, logic and common experience. When, on the other hand, a passage in Scripture has an obvious meaning, which seems to go against reason or common experience, Augustine insists that Scripture should be accepted at face value and believed nonetheless.[20] In other words, this quotation counsels Christians not to do puerile things with obscure passages in Genesis. The specific example to which the Church Father applies his warning is Genesis 1:3, about the creation of light as a phenomenon before the actual creation of sun, moon, and stars.

A second textual point that should be taken into consideration is that this passage is about facts that can be observed. Augustine argues against replacing proper exegesis with factually incorrect information about things that actually happen, and people can see for themselves. He is talking observable science, not metaphysical theories of origin, and that only for interpreting obscure passages of Scripture. Translated for a contemporary scientific context this would mean: evolutionary processes in nature, insofar as these are factual, observable, and repeatable, are not the issue. Scholars who take the historical message of the Bible seriously generally recognize the reality of change in this present world. However, on the basis of God's revelation they adhere to a different metaphysical theory of origins, namely that evolution cannot be used to explain the development of this world from its very beginning. In their present form these processes cannot be used to extrapolate back to a creation event, but should be connected to the 'Cosmic bend' in history (C.S. Lewis) that took place when mankind fell into sin (figure 2). Since that time the natural world is subject to principles of violence (*chamas* חָמָס) that were not part of God's original creation.

Thirdly, the wider textual context of this quotation confirms that for Augustine a clear meaning of Scripture overrules other considerations, even if Scripture happens to contradict normal experience or predominant theories of science. This is evident in the *Literal Meaning of Genesis* as a book, but also other writings such as the *City of God*. Unlike today, God's revelation was considered a reputable

way to access scientific and historical truth. Truth could be acquired by personal experience and reason or by means of revelation. Philosophy or science concerned itself with the former and theology with the latter. This would remain the paradigm for Western Christianity until the Enlightenment. For this reason Augustine accepts the miracles and divine interventions that Genesis records as historical. For him God had spoken reliably through Moses, so paradise was a location on this Earth and Adam and Eve were the parents of all mankind.

The points above show that theistic evolutionists use Augustine in a way that completely fails to do justice to the source. Rather than cautioning against a literal interpretation of Genesis, Augustine actively encourages it. His warning is directed against Christians who try to tackle obscure verses without knowledge or common sense. Whosoever applies this quotation to opponents of Darwinism does so ill-advisedly, because this use implies that any supernaturalist position should be abandoned, also on topics that many theistic evolutionists hold dear, like: Our Lord's virgin birth, his miracles and resurrection, the Apostles' Creed, Nicaea, and basically every main tenet of the Christian faith. In its departure from the historical infallibility of Scripture, the theistic evolutionist approach is reminiscent of an earlier intellectual gliding scale. There is a long list of Enlightenment scholars, starting in the 17th century, who, unlike Augustine, believed that cherubs do not brandish flaming swords, and finally ditched all the supernatural from Scripture.[21]

**Figure 2.** The expulsion of Adam and Eve from Paradise (Gustave Doré)

## Beyond the quote

While Augustine continues to be quoted out of context, there are several aspects of Augustine's argument that every orthodox believer should take to heart. A personal reflection on and beyond the quotation as such:

Firstly, God's Word is holy. Public exposition of God's Word, both from pulpits and in journals, requires learning as well as a special calling to do so. This does not sit well with our neo-evangelical times, where every Tom, Dick, or Sally takes up his ESV or NIV. Nonetheless this is one of the reasons why there are few academic theologians who take a creationist position seriously. Theology may seem a free-for-all in some circles, but generally it isn't. A sense of calling is simply not good enough. One's calling, as well as its exercise, must meet biblical requirements. God's Word requires faithful exposition. This calls for many years of accumulated expert knowledge and thorough familiarity with the original languages.

Secondly, how genuine is our reference to the Fathers of the Church? Creationists might be guilty of the same selective use that this article ascribes to some theistic evolutionists. Do we read the Church Fathers only to pick up the odd quote that supports our position, or do we read them in context? Are we genuinely interested in taking a position that reflects the doctrines of historic Christianity, or just looking for a quick proof text?

Thirdly, a little bit of knowledge is not only dangerous, but can be extremely irritating for others who know so much more. Someone with a

Ph.D. and many years in the field is aware of many aspects of a problem, as well as related issues. For a theistic evolutionist with this background it can be exasperating to meet 'yet another creationist' who has read one or two books and behaves like an expert who can debate on equal terms, while the theistic evolutionist has practised university science for 30 years.

Of course this has a background. Tertiary education has been almost completely secularized, particularly over the last 20 years. Academia has ruthlessly slaughtered many dissidents,[22] as has the church. Believers have been forced to go out and fend for themselves, with however limited means. Even the Vatican has distanced itself from its creationist doctrine under Pope John Paul II and Benedict XVI. Since Cardinal Schönborn was pulled into line for his Intelligent Design (ID) sympathies 10 years ago and Cardinal Meissner sidelined as an ancient voice in the wilderness, Rome openly disassociates itself from its former creationist stance, to such an extent that even ID may not be advanced. Those who still dare speak up are few and speak from unattractive places like Kazakhstan, posted where they were supposed to do least harm. In most mainline protestant denominations the situation is not much different, or worse.

Fourthly, expertise in one field of study means just that. The creationist cause is best served by the old proverb "Cobbler, stick to thy last". A last was a piece of wood shaped like a human foot and used in making or repairing shoes. Everyone should stick to his own area of competence. Granted, it is perfectly alright to teach others the basics, or other appropriate levels. You may not have an education in science, but, by all means, if you have done a lot of reading on a subject, run a seminary on creationism in your local church or school. There are parents who run excellent home-schools that compete with the best in formal secondary education. But that doesn't make you an expert, so don't behave like one. Stick to what is appropriate. Don't overreach, admit where you are not really qualified to give a suitable answer, but support the cobblers to do their work. Even if you are an expert with a Ph.D. in one field, that does not automatically qualify you for other fields. A renal specialist should not try and do the work of an ophthalmologist. Although he could give basic advice from his education and experience as a General Practitioner, he would be ill-advised to do surgery in the other's field.

Lastly, this debate is very similar to Andersen's tale about the *Emperor's New Clothes* (1837; figure 3). Nobody would confess that he couldn't see anything, for that would prove him either unfit for his position, or a fool. No costume the Emperor of Evolution had worn before was ever such a complete success as his Augustinian cloak. "But he hasn't got anything on", a little child said. One needn't be an expert tailor or even an adult, to call attention to the obvious.

**Figure 3.** The Emperor's New Clothes

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7. A preliminary remark from the Latin original of this passage: Although Taylor has done a superb job, in this place the Latin is probably not as derogatory as the English translation suggests with "even a non-Christian knows something about". In the context of this chapter (*De Genesi ad litteram* I.19), a non-comparative translation (of *etiam-ita, see ref. 8*) makes more sense: "Indeed, also a non-Christian usually knows one or two things about the earth, the heavens" etc.
8. See Taylor, ref. 4, pp. 42–43. The italicised quote in Taylor's translation refers to 1 Timothy 1:7. Cf. Augustinus, A., *De Genesi ad litteram* (Augustini Opera Omnia—editio Latina PL34), Nuova Bibliotheca Agostiniana, Roma 2016, *I.19.39:* "*Plerumque enim accidit ut aliquid de terra, de coelo, de caeteris mundi huius elementis, de motu et conversione vel etiam magnitudine et intervallis siderum, de certis defectibus solis ac lunae, de circuitibus annorum et temporum, de naturis animalium, fruticum, lapidum, atque huiusmodi caeteris, etiam non christianus ita noverit, ut certissima ratione vel experientia teneat. Turpe est autem nimis et perniciosum ac maxime cavendum, ut christianum de his rebus quasi secundum christianas Litteras*

*loquentem, ita delirare audiat, ut, quemadmodum dicitur, toto coelo errare conspiciens, risum tenere vix possit. Et non tam molestum est, quod errans homo deridetur, sed quod auctores nostri ab eis qui foris sunt, talia sensisse creduntur, et cum magno eorum exitio de quorum salute satagimus, tamquam indocti reprehenduntur atque respuuntur. Cum enim quemquam de numero Christianorum in ea re quam optime norunt, errare comprehenderint, et vanam sententiam suam de nostris Libris asserere; quo pacto illis Libris credituri sunt, de resurrectione mortuorum, et de spe vitae aeternae, regnoque coelorum, quando de his rebus quas iam experiri, vel indubitatis numeris percipere potuerunt, fallaciter putaverint esse conscriptos? Quid enim molestiae tristitiaeque ingerant prudentibus fratribus temerarii praesumptores, satis dici non potest, cum si quando de prava et falsa opinatione sua reprehendi, et convinci coeperint ab eis qui nostrorum Librorum auctoritate non tenentur, ad defendendum id quod levissima temeritate et apertissima falsitate dixerunt, eosdem Libros sanctos, unde id probent, proferre conantur, vel etiam memoriter, quae ad testimonium valere arbitrantur, multa inde verba pronuntiant, non intellegentes neque quae loquuntur, neque de quibus affirmant.*"

9. See noanswersingenesis.org.au/saintaugustine.htm, accessed 31 August 2016.
10. "Christenen geloven dat God aan het begin van de kosmos staat en van dag tot dag betrokken is op deze wereld. Het wetenschappelijke beeld van een miljarden jaren oude wereld ondergraaft het gezag van de Bijbel op geen enkele manier, en een evolutionaire ontwikkeling van het leven op aarde doet dat evenmin. Wetenschap verschaft binnen een eigen kader inzicht in het 'hoe' van de oorsprong en ontwikkeling. De Bijbel spreekt in een heel andere taal over de oorsprong van de wereld en de mensheid en geeft vooral een duiding van het 'waarom' en 'waartoe'; het is geen boek van natuurwetenschap maar een boodschap van hoop en genade." Source: geloofenwetenschap.nl/index.php/opinie/item/750-oude-dino-s, accessed 31 August 2016.
11. Guinagh, K., Saint Augustine and evolution, *The Classical Weekly* **40**(4): 28, 1946.
12. In *De Civitate Dei* (liber 12, c.11), Augustine argues against Greek philosophers who held that the human race always existed. He speaks of the falseness of the history which ascribes many thousands of years to times gone by (*de falsitate eius historiae, quae multa millia annorum praeteritis temporibus ascribit*) and says: "Such men are also misled by certain wholly untruthful writings which purport to contain the history of many thousands of years of time. For we compute from the sacred writings that six thousand years have not yet passed since the creation of man. Hence, the writings which make reference to far more thousands of years than there have been are vain, and contain no trustworthy authority on the subject." (*Fallunt eos etiam quaedam mendacissimae litterae, quas perhibent in historia temporum multa annorum milia continere, cum ex litteris sacris ab institutione hominis nondum completa annorum sex milia computemus. Unde ne multa disputem quem ad modum illarum litterarum, in quibus longe plura annorum milia referuntur, vanitas refellatur et nulla in illis rei huius idonea reperiatur auctoritas.*) Added to this, Augustine taught an immediate creation without the possibility of a gap theory, as he denied that God used pre-existent material in creation, see Gay, J.H., Four Medieval Views of Creation, *The Harvard Theological Review* **56**(4):249, 1963. Christian argued that Augustine was only meant to address the age of mankind, not the history of the world, see Christian, W.A., Augustine on the Creation of the World, *The Harvard Theological Review* **46**(1):17, 1953. This is less likely as Augustine addresses the Greek fallacy of an everlasting world in the next chapter, and makes a similar argument about Adam and Eve two chapters later (liber 12, c.13) where the context is the age of the world.
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14. Augustine's *Retractiones 24.1–2* admits that initially it was a real struggle for him to seek for the real meaning of Scripture, allegorical interpretations took so much less effort, but that he persevered after several attempts. Looking back, he also states that these books about the literal meaning of Genesis raised a lot of questions that did not receive a definite answer. This, however, refers to theological questions, not to the historical aspects and reliability of Genesis. Adam was still very much driven from a literal paradise, and a flaming sword was placed to guard the way to a real tree of life (*de paradiso dimissus est Adam, et flammea romphaea posita est custodire viam ligni vitae).* Augustine, while confessing his own fallibility and the shortcomings of his attempts at answers, continued to believe in his approach as such. That he also didn't change his literal historical view on Genesis is firmly suggested by the fact that his revisions for the *Literal Meaning of Genesis* do not concern matters of science or historical reliability, but theological interpretations.
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# Beyond original sin?

*Dominic Statham*

According to Denis Lamoureux, the early church was wrong in teaching the doctrine of Original Sin. This error, he claims, arose from the Apostle Paul's mistaken view that Genesis contains a historically accurate account of creation. Science, he says, has shown that there never was a real Adam and therefore there never was an original sin. Hence, he believes, modern theologians should base their beliefs about sin and salvation on 'evolutionary psychology'. Lamoureux's arguments, however, are self-contradictory and ignore counter arguments.

Denis Lamoureux is an Associate Professor of Science and Religion at St Joseph's College in the University of Alberta. He describes himself as an 'evolutionary creationist' and believes that God used the Darwinian process to create people.[1] Moreover, despite identifying as 'an evangelical Protestant', in an article published in *Perspectives on Science and Christian Belief*, he denies the doctrine of Original Sin.[2] Science, he believes, has shown that there never was a historical Adam and therefore there never was an original sin.[3]

## What is the doctrine of Original Sin?

According to the *Westminster Confession of Faith*:

> "Our first parents ... sinned, in eating the forbidden fruit. By this sin they fell from their original righteousness and communion with God, and so became dead in sin, and wholly defiled in all the parts and faculties of soul ... . They being the root of all mankind ... the same death in sin and corrupted nature [was] conveyed to all their posterity."[4]

The Bible teaches that Adam and Eve were created, fully formed, on the sixth day of creation (Genesis 1:26–27). Along with everything else, they were "very good", i.e. physically and morally perfect (Genesis 1:31). However, despite God showing them much goodwill—giving them a beautiful place in which to live and offering them His friendship—they disobeyed Him, "eating from the forbidden fruit", and embraced evil (Genesis 3). Consequently, they "fell from their original righteousness" and "became dead in sin", meaning that they lost their "communion with God" and became sinful, "wholly defiled in all the parts and faculties of soul". Hence, they came under God's righteous judgment which, on Earth, would culminate in physical death (Genesis 3:19 and Romans 6:23). Due to Adam and Eve being the "root of all mankind"—i.e. progenitors of all humanity (Acts 17:26, Genesis 3:20)—they passed this fallen nature to "all their posterity", i.e. to every man, woman and child who has even lived. Particularly, Adam acted as our 'federal head', representing the whole of humanity. Hence, the Apostle Paul wrote: "sin came into the world through one man, and so death spread to all men because all sinned" (Romans 5:12).

Throughout church history the doctrine of Original Sin has been considered foundational to the Christian faith. It makes clear that all are sinners, even from the moment of conception (Psalm 51:5), and explains why even babies and the unborn may suffer and die. It enables us to understand ourselves—why we behave as we do—and why so many mind-boggling atrocities have been committed throughout history. It also points us to Christ as the only solution to our sin; as the Apostle Paul wrote: "For as by the one man's disobedience [i.e. Adam's] the many were made sinners, so by the one man's obedience [i.e. Christ's] the many will be made righteous" (Romans 5:19).

The Bible teaches that a person is either 'in Adam' or 'in Christ'. If we are 'in Adam' we are still in sin and under God's judgment; if we are 'in Christ' we become partakers of His righteousness and escape judgment (Romans 5:18–19). There was a literal Adam, through whom we literally became sinners and die; and there is a literal Christ through whom we may literally become righteous and receive eternal life. There is no other way of salvation presented in Scripture, and Lamoureux's rejection of a historical Adam undermines the Gospel at its heart.

Moreover, if the New Testament is wrong about these matters why should we consider it to be authoritative in anything else? If the Apostle Paul was wrong in believing in a historical Adam then, presumably, so too was Christ. Should we then also question what the Son of God taught about marriage? (See Mark 10:5–9.) Once we begin to think like this, it is only a matter of time before every biblical doctrine becomes open to debate.

## How does Lamoureux argue his case?

Remarkably, Lamoureux begins by setting forth the biblical basis for a historical Adam and Original Sin, acknowledging that both are clearly taught in Scripture. For example, he quotes nine verses from Paul's letters

which confirm this to be apostolic teaching (Romans 5:14–19; 6:23; 1 Corinthians 15:21–22) and concludes:

> "In the light of these passages, there is little doubt that Paul accepted that (1) Adam was a historical person, (2) sin first entered the world through Adam, (3) Adam's sin resulted in all humans becoming sinners, (4) death entered the world as the divine condemnation for the sin of Adam, and (5) Adam's sin resulted in the divine condemnation and death of all humans."

At the same time, Lamoureux accepts that the *Council of Carthage*, the *Thirty-Nine Articles* of the Anglican Church and the *Westminster Confession of Faith* all affirm this Pauline doctrine. Moreover, he writes: "To summarize, the doctrine of original sin is deeply entrenched within the Western Christian tradition ... everyone should feel the weight of challenging this historic doctrine, as I do." Despite this, he confidently asserts that the Apostle Paul was mistaken and argues that this error arose from Paul's understanding of Genesis 1–11 as referring to real, historical events.

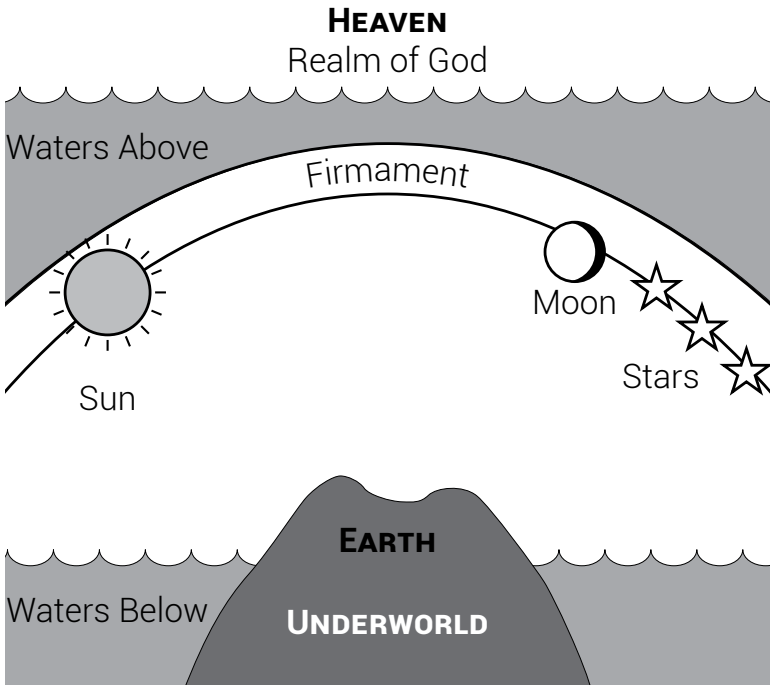


**Figure 1.** According to Denis Lamoureux, the Bible teaches that the universe is made up of an underworld, the earth, a solid dome (the 'firmament') and a heavenly sea.

## A self-refuting argument

According to Lamoureux, some of the Bible's teaching reflects ancient views of cosmology and biology which we now know to be wrong. Since Genesis is not true scientifically, he argues, it should not be understood to be true historically. The explanation for these errors, he says, is that:

> "[T]he Holy Spirit, by inspiring the biblical writers, descended to their level and allowed the use of the science-of-the day in order to reveal inerrant spiritual truths."

In other words, God affirmed that which is false in order to help people grasp that which is true. This, however, is plainly absurd; and even more absurd is that, according to Lamoureux, the policy backfired, as it led to the Apostle Paul misunderstanding Genesis and the Christian church teaching error for two thousand years. Could the all-knowing, all-wise God not have done better than this?

## Does the Bible teach faulty cosmology?

According to Lamoureux, "Ancient science is unmistakably present in the Genesis 1 account of creation" which, he says, reflects the 'scientific' model of the universe generally accepted at the time. This stipulated that there was a solid dome surrounding the earth which contained the sun, moon, and stars and which supported a heavenly sea above it (see figure 1). Lamoureux uses the word 'firmament' to describe this dome, following the King James translation of the Bible:

> "And God said, Let there be a firmament in the midst of the waters, and let it divide the waters from the waters. And God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament: and it was so" (Genesis 1:6–7).
>
> "And God made two great lights; the greater light to rule the day, and the lesser light to rule the night: he made the stars also. And God set them in the firmament of the heaven to give light upon the earth" (Genesis 1:16–17).

The word 'firmament' comes from the Latin *firmamentum* which generally refers to a physical support or prop, i.e. something solid. The Greek translation of the Old Testament known as the Septuagint (c. 200–300 BC) uses the word *stereoma* which, again, suggests something solid. However, the focus of our attention should be the meaning of the original Hebrew word, i.e. *raqiya*. Other Bible versions—e.g. ESV, NASB and NIV (1984)—translate this as 'expanse', a term that reflects the sense of something having been 'expanded', i.e. stretched abroad. This would

seem reasonable as the root of *raqiya* is the Hebrew word *raqa* which means to beat, stamp, beat out, or spread out, and is used, for example, to refer to the hammering out of thin sheets of gold (Exodus 39:3). According to Genesis 1:8, God called this expanse *shamayim*, which is Hebrew for 'sky' or 'heavens', and is specifically stated to be something that God "stretched out" (e.g. Job 9:8, Isaiah 42:5, Jeremiah 10:12). It is also the place where birds fly (e.g. Genesis 1:20, Deuteronomy 4:17) and God placed the stars (Genesis 1:15). Hence, the context indicates that *raqiya* is not intended to be understood as a solid object but an expanse which includes our atmosphere and space beyond it.[5]

The question might be asked: 'If the "waters above" are not a heavenly ocean supported by a solid dome, what are they?' A view once popular among creationists held that they were a vapour canopy surrounding the earth which collapsed to provide rain during the Noahic Flood—however there has been less support for this in recent years.[6] Another view is that they surrounded the solar system as ice bodies, many of which fell to Earth during the Flood, causing numerous impact craters. Others understand them to be the clouds; still others, a watery shell surrounding the universe.

Lamoureux claims that the ancient Hebrews generally, along with many in the Christian church, held to a cosmology based on the existence of a firmament. However, even if completely true, all this misses the point. The issue is not how people may have interpreted the Bible in the past, but what the Hebrew text actually says. The view that *raqiya* refers to something solid probably did arise from 'scientific thinking' prevalent among ancient peoples and may well have influenced the choice of the word *stereoma* by the translators of the Septuagint; but this does not demonstrate that *raqiya* originally carried this meaning or that this is how it was understood by the people for whom Genesis was first written.

Similarly, Lamoureux justifies his rejection of biblical inerrancy by arguing that the Bible teaches that the sun revolves around the earth and that this was the view held by Luther and Calvin. However, just because some have understood the biblical reference to the sun 'standing still' (Joshua 10:12–13) as affirming geocentrism does not mean that, in such passages, the Bible intends to make scientific statements about the relative motions of the heavenly bodies. Meteorologists today speak of 'sunrise' and 'sunset' even though they are not geocentrists.[7]

What is relevant, however, and does merit a response, is the contention that aspects of the *Apostle Paul's* teaching were derived from a faulty Hebrew cosmology—if so, biblical inerrancy would be in question. Here Lamoureux argues that Philippians 2:9–11 reflects an acceptance of the ancient belief in a three-tier universe made up of heaven, the earth and an inhabited underworld:

> "Therefore God has highly exalted him
> and bestowed on him the name that is above every name,
> so that at the name of Jesus every knee should bow,
> *in heaven and on earth and under the earth*,
> and every tongue confess that Jesus Christ is Lord,
> to the glory of God the Father [emphasis added]."

Many, however, understand these verses to be written in poetic form and think that Paul may be quoting a Christian hymn—hence the name *Carmen Christi* for this passage.[8,9] Poetry is surely not the place to look for scientific statements as to the physical nature of the earth. An alternative understanding of the text is that Paul is using figurative language: those 'in heaven' are angels and redeemed people and those 'under the earth' are demons and condemned people.

## Does the Bible teach faulty biology?

Lamoureux correctly states that the view of humanity as having been originally created from earth was held generally by people in the ancient Near East. For example, he states that, in the *Epic of Gilgamesh*, a pinch of clay is used to create a man; in the *Myth of Enki and Ninmah*, seven humans are made from moist earth; in the *Epic of Atrahasis*, seven males and females are made from a mixture of clay and the blood of a god; in the *Memphite Theology*, a god forms babies from clay on a potter's wheel and then places them in their mothers' wombs. We might add that similar accounts are found worldwide.[10]

According to Lamoureux, God inspired the writers of Genesis to adopt this ancient 'scientific' explanation for how God made people. He writes: "Clearly, the creation of Adam is based on an ancient conceptualization of human origins." But how can he know this? Surely there is an alternative explanation, i.e. that Genesis contains the first (and historically true) account, which was passed down by Noah to his descendants. This then became distorted in extra-biblical writings due to it having been retold to subsequent generations with variations and embellishments.

One of the arguments for Original Sin comes from two verses in Hebrews which comment on a passage in Genesis where Abraham pays a tithe to Melchizedek:

> "One might even say that Levi himself, who receives tithes, paid tithes through Abraham, for he was still in the loins of his ancestor when Melchizedek met him" (Hebrews 7:9–10).

Here Levi, being a descendant of Abraham, is deemed to have paid a tithe to Melchizedek. This is because, despite being born many years later, he is understood to have been in Abraham's body at the time the gift was made. Just as Levi was 'in Abraham' when Abraham paid the tithe, so

also the whole of humanity was 'in Adam' when Adam ate of the forbidden fruit. As pointed out by Lamoureux, this was the interpretation taught by the celebrated church father, Augustine. However, according to Lamoureux, Augustine misunderstood these verses because of his erroneous belief in 'seminal principles'—the 'scientific view' that the original animals created by God grew from seeds. Lamoureux's claims about Augustine and his 'biology', however, are irrelevant. As I keep saying, the issue is not what the ancients believed about science or how this may have influenced their interpretation of the Bible. What matters is what Scripture itself teaches.

## Lamoureux's 'science'

Undoubtedly the main reason for Lamoureux's rejection of a historical Adam is his belief in evolution. "Physical anthropology," he writes, "reveals an incontestable pattern of transitional fossils from pre-humans to humans." Furthermore, he claims: "Genetics demonstrate that humans were not created *de novo*, but evolved from a population of about 10,000 pre-humans." Fossils and genetics, however, demonstrate nothing of the sort.

According to Bernard Wood, Professor of Human Origins at George Washington University:

> "There is a popular image of human evolution that you'll find all over the place … . On the left of the picture there's an ape … . On the right, a man … . Between the two is a succession of figures that become ever more like humans … . Our progress from ape to human looks so smooth, so tidy. It's such a beguiling image that even the experts are loath to let it go. But it is an illusion ... [P]aradoxically, the more we discover about our origins, the less we know."[11]

Professor Chris Stringer is a paleontologist at the British Museum of Natural History. Commenting on the museum's recent (2015) 'human evolution' exhibition he made a very significant admission:

> "Well, we've attempted here to represent about 7 million years of human evolution on one diagram and you'll notice a lot of skulls there with different species names … . But you'll notice also, unlike many of these depictions, we haven't joined them up with lines of ancestors and descendents and that's a reflection of the uncertainty about how these forms are related."[12]

In other words, despite there being 'a lot' of different species, he had found it impossible to put them in an order showing a clear evolutionary progression from ape-like creatures to man. This is a far cry from Lamoureux's "incontestable pattern of transitional fossils from pre-humans to humans". A perfectly reasonable understanding of 'hominid' fossils is that they are either true apes or true humans.[13]

According to Lamoureux, the variation in our genes proves that we cannot be descended from just one couple, i.e. Adam and Eve. Geneticist Dr Robert Carter, however, argues that the data *can* be seen to fit within such a creationist framework. Most genetic variation comes in two versions and these are found distributed throughout the world's population. Where greater variation is seen, it is generally restricted to specific groups and can be explained by mutations occurring after humanity dispersed from Babel.[14]

Lamoureux argues: "If Adam is the reason suffering and death entered the world, then human bones should be at the bottom of the fossil record. But humans appear at the very top." However, if the fossil record is largely the consequence of the Genesis Flood, which arose due to the bursting forth of the "fountains of the great deep" (Genesis 7:11), we would not expect to find human fossils in the lowest sedimentary rocks. These are more likely to contain the remains of marine creatures living on the sea floor, as these might be expected to be the first to have been buried by sediments deposited by the Flood waters.[15] It may well be that no human fossils lie buried in rocks laid down during the Flood and that those we do find are all post-Flood. If so, we would expect there to be human fossils only at the top of the geological column.[16]

## Sin and the atonement

Having dismissed the Bible as his authority, Lamoureux turns to 'evolutionary psychology' in his attempt to understand sin. The evolutionary process, he says, led to behavioural tendencies being deeply embedded in our brains, some being "self-preserving inclinations" and others "group-bonding inclinations". The former are Lamoureux's version of sin and the latter his version of righteousness. Hence, he replaces the Apostle Paul's cry, "Wretched man that I am! Who will deliver me from this body of death?" (Romans 7:24) with "Who will rescue me from my evolutionary self-preserving inclinations?" Similarly he replaces Paul's commands, "[B]e transformed by the renewal of your mind ... [and] put on the Lord Jesus Christ, and make no provision for the flesh, to gratify its desires" (Romans 12:2, 13:14) with "Let Jesus be the Lord over our evolutionary past, encouraging our pair- or group-bonding inclinations and denying our self-preserving inclinations." Are we to understand, then, that Christ died to conquer a nature we inherited as a result of the process of 'evolutionary creation'?

All this has the most serious implications. First, if sinfulness arose through a God-ordained evolutionary process, then God, not man, is responsible for it. This is nothing short of heresy. Second, this thinking appears to have led Lamoureux to misunderstand the true nature of

sin. For example, he criticises Augustine for portraying it as "an unnatural and disordered condition". Astonishingly, Lamoureux states a preference for views of morality taught in Cherokee folklore and modern Buddhism. These, he claims, more accurately depict the "turmoil we often experience between our evolutionary behavioral proclivities".

Even a cursory study of history, however, makes clear that the orthodox Christian view is the correct one.[17] In the Soviet Union, it is estimated that about 26 million people were killed simply for 'political reasons'. This included about six million Ukrainian citizens who died from forced starvation, the *Holodomor*. In December 1937, the Japanese army raped, tortured, and murdered over 300,000 Chinese in the city of Nanking. People were used for bayonet practice and in decapitation contests. Some of the tortures and depravity are too awful to describe. During World War II, millions of Jews were transported to 'death camps' travelling for days without food or water, crammed together in sweltering rail carts, packed so tightly that there was no room to sit. Those who survived the journey were worked to death, or used for hideous 'human experiments', or sent straight to the gas chambers. Human cruelty is truly unimaginable; yet, as noted by Dr Clay Jones: "[E]very genocide researcher and genocide survivor concludes that it is the average member of a population that commits these horrors."[15]

## Conclusion

There is one point on which both Lamoureux and I would agree. Scholars of the past who have used science to interpret the Bible have been mistaken. However, this is exactly what Lamoureux himself is doing. His contention that Adam never existed, and that the doctrine of Original Sin is wrong, is underpinned by his belief that science has demonstrated special creation to be false and evolution to be true.

Lamoureux's case rests on the premise that Scripture undoubtedly teaches erroneous science. However, he accepts arguments used to cast doubt on the Bible uncritically, and ignores counter arguments. Particularly, the evidence he presents for a faulty cosmology is very weak, relying largely on how Genesis has been interpreted historically, rather than on a careful consideration of the texts themselves. Neither paleontology nor genetics support his rejection of a historical Adam.

Lamoureux's theology suffers from his very low view of Scripture which arises from his placing 'science' over the Word of God. In consequence, he rejects apostolic authority (and presumably that of Jesus too, though he seemingly avoids stating this outright) and formulates 'Christian doctrine' on the basis on his own opinions. His 'evolutionary creationism' would lead one to conclude that God is responsible for sin which is a most serious heresy.

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# Can the Ica Stones be independently authenticated?

*David Woetzel and Dennis Swift*

Perus's enigmatic Ica Stones have been puzzling historians and scientists for many decades. Allegedly found in ancient tombs, the library of engraved rocks displayed at the private Cabrera Museum facility in the village of Ica, Peru, contains clear dinosaurian representations. Dinosaur drawings from pre-Colombian cultures are highly problematic for the prevailing theory that all dinosaurs became extinct before man evolved. However, these artifacts have been viewed with considerable skepticism since they were not found and documented by trained researchers. But other similar ceremonial burial stones were discovered and documented by international archaeologists and are housed in the collections of respected museums. This article explores ways to test Ica Stones to independently establish their antiquity or to confirm that they are merely modern productions created by enterprising local artisans.

The Ica and Nazca valleys in southern coastal Peru enjoyed a rich history as tribal Indian groups rose to prominence, like the prominent Nazcan culture which lasted from 100 BC to approximately AD 650 and the Ica culture which flourished from about AD 600 to almost AD 1200.[1,2] Tribal groups like the Nazcas, Icas, Wari, and especially the Paracas left behind numerous beautiful artifacts buried in their desert tombs. Along with rich fabrics, ancient tools, and detailed gold and ceramic works are engraved ceremonial stones from these peoples. The stones were first found in the tombs of the Ica Indians and so the generic name 'Ica Stones' was applied to them all. Antiquities from this region are typically dated by archaeologists using generalized 'Ceramic Periods' (table 1).

These stones are rounded andesite river rock, sourced locally in southern Peru, which have been worked by artisans in one of two ways. The primary methodology involved in manufacturing Ica Stones is blackening the surface of the stone. (Probably this black coating came from tar pits that are located south of the Ocucaje Desert.) Then grooves measuring about 1/16 of an inch deep were etched into the stone. The other methodology involves bas relief artwork (where the surface of the stone is lowered, leaving the artistic depictions raised above the surface of the stone).

The name 'Ica Stones' seems to have stuck because of the vast collection of these stones assembled in the village of Ica, Peru, by Javier Cabrera Darquea. Cabrera was a Professor of Medicine and head of his department at the University of Lima. He was also named Director of Culture for the Province of Ica. Cabrera became enamored with a collection of 600 engraved stone artifacts owned by the Solté brothers. Carlos and Pablo Solté operated a plantation in Ocucaje and allegedly obtained those stones by excavating tombs on their own property. After buying half of the Solté collection, Cabrera augmented this archive by purchasing stones from locals who claimed to discover them during tomb excavations. Eventually over 11,000 such stones became part of the private Cabrera Museum collection.[3] The stones range in size from ones weighing a diminutive 100 grams to giant lithic art specimens weighing approximately 25 kg. The engraved pictures run the gamut from simple insects to elaborate fishing scenes and warriors fighting with what appear to be dinosaurian creatures. Even skeptics concede:

> "And what do these etchings show? You guessed it: brontosaurs, triceratops, stegosaurs, and the whole dino collection of beasts!"[4]

## Categorizing the stones

The Ica Stones can be divided into three categories based on their provenance. There have been numerous stones discovered during documented tomb excavations involving qualified archaeologists. For example, in 1968 the Peruvian archaeologist Pezzia Assereto published a book on the archaeology of the province of Ica. As the representative of the National Archaeology Department of Peru, Assereto was in charge of excavations at the ancient Paracas and Ica

**Table 1.** Generalized ceramic periods in Peru

| Period | Dates | Cultures |
|---|---|---|
| **Late Horizon** | AD 1476 – 1534 | Inca |
| **Late Intermediate** | AD 1000 – 1476 | Chimú, Chancay |
| **Middle Horizon** | AD 600 – 1000 | Wari, Tiwanaku |
| **Early Intermediate** | AD 200 – 600 | Moche, Nazca, Tiwanaku |
| **Early Horizon** | 900 BC – AD 200 | Chavin, Cupisnique, Paracas |
| **Initial Period** | 1800/1500 – 900 BC | Early |

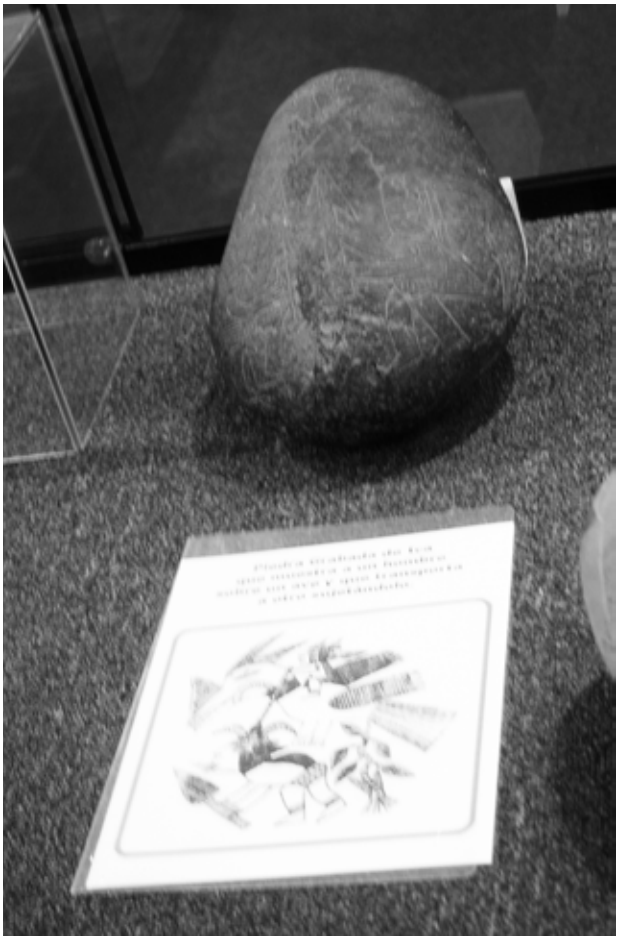


**Figure 1.** Ica Stones on display at the Museo Aeronáutico

cemeteries of Max Uhle and Toma Luz. He was initially suspicious of the private Ica Stone collections. However, after a considerable amount of work, he was able to find an engraved stone in situ at a tomb, which proved to his satisfaction "the authenticity of these artifacts".[5] Later, in the San Evaristo cemetery in Toma Luz, Assereto found another blackened burial stone displaying a very realistic image of a fish. He dated the tomb to the Middle Horizon period (AD 600–1000).[6] He further recorded the discovery in an Ica tomb of a ceremonial stone with a flat surface on which was carved a realistic image of a llama.[7]

The various stones discovered by Assereto became part of the collection at Museo Regional de Ica. Other official museums involved with Ica Stone artifacts include Lima's Museo Aeronáutico (figure 1), the Naval Museum, the Nazca Museum (Didactic Museum Antonini), and the Palpa Museum of Peru. These museum pieces appear identical in manufacturing to the stones at the Cabrera Museum (as to the patina build-up, the bas-relief artistic style, and the depth of the etching). But their collections are not nearly as vast and don't contain the controversial dinosaur depictions. We will call the Ica Stones in this category 'museum stones' (see table 2).

The Cabrera collection (figure 2) has long been viewed with skepticism because their artifacts were not found by archaeologists. Rather, they have come from impoverished, local Peruvians who know the landscape and are adept at finding desert tombs, digging down into them, and removing the valuables. These are the Huaqueros. They operate in a grey area of the law, digging without a permit, and selling finds to archaeologists, private collectors, and even world-class museums. The unspoken rule of the Huaqueros is that they never reveal where they find things. To be arrested as a grave robber could result in many long years in Peruvian prisons. One such tomb digger, Basilio Uschuya, especially fell under the suspicion of actually producing the stones to sell to Cabrera after artificially 'aging them'.[8] While the implausibility of this accusation has been dealt with elsewhere,[9] the Cabrera collection must be classified as 'stones of unknown provenance' (a second category).

This brings us to the third category. Recently manufactured stones are available for sale to tourists. The fascination of New Agers, UFO advocates, and curious visitors ensures a ready market. After multiple visits, I (Swift) built up a friendship with Basilio Uschuya. On one such visit I offered to pay him to make me a dinosaur stone. It took a full day for him to carve a crude dinosaur onto a small stone using a hacksaw blade. The stone wasn't much to look at (figure 3), but I was pleased that I had in my possession a 'Basilio original' which we could utilize later for comparison. Such recently produced artifacts we will call 'souvenir stones'.

**Figure 2.** Woetzel at the Cabrera Museum in Ica, Peru

**Figure 3.** Basilio Uschuya souvenir stone

**Figure 4.** Rio Grande Palpa Museum stone, held by Swift

## Authentication

To the best of our knowledge no testing has been done on the Ica Stones by those who claim the stones were recently manufactured. And no rigorous critique of them has been published in the literature. Stones that have been found by museum-sponsored excavations or prominent archaeologists have, naturally, been accepted without authentication. But the Ica Stones of unknown provenance are another story. Seeking to establish credibility for his collection, Cabrera commissioned a number of tests on his artifacts. For example, in 1967 a few of his stones were submitted for examination to staff at a mining company in Lima. Geologist Eric Wolf documented his opinion that the patina and signs of wear demonstrated antiquity.[10] Wolf then submitted the stones to a laboratory in Bonn, Germany, for further testing. Cabrera later reported:

> "On January 28, 1969 I received word from Eric Wolf that the results of the laboratory analysis conducted by a Professor Frenchen and his assistants at the University of Bonn were available. The stones were andesite and were covered by a patina or film of natural oxidation which also covered the etchings, permitting one to deduce that they are very old."[11]

Some independent researchers have taken the initiative to analyze the Cabrera Ica Stones and concluded they are genuine antiquities. Ryan Drum is an American biologist from Iowa State University. While a NATO Scholar, he did postdoctoral studies on cell biology with an electron microscope at the Universities of Bonn, Germany, and Leeds, England. Drum has authored over 30 scientific papers in peer-reviewed journals, and has written the book *Electron Microscopy of Diatom Cells*. In the 1970s he brought two Ica Stones to the US and performed a microscopic analysis of them. Drum wrote: "I have examined the rocks at 30 and 60 magnification in a stereo microscope, and found no obvious grinding or polishing marks …"[12] When I (Woetzel) corresponded with him regarding patination, Drum clarified: "There was some desert varnish but not enough for me to estimate age."[13]

Over the course of the last two decades I (Swift) have travelled numerous times to southern Peru, building up relationships with Cabrera, various museum officials, archaeologists and Huaqueros. On one trip Cabrera gave me a couple of his Ica Stones that had dinosaurs engraved upon them. I have personally visited the desert tomb sites on a number of occasions. Once while a group of us were walking over a grey desert hill that was a burial mound, we came upon some previously unknown tombs that had only recently collapsed and there, to my surprise, I discovered an engraved stone in situ, embedded in the side of the tomb. I filmed this with a camcorder. That particular stone was decorated with some non-descript geometric shapes.

In the spring of 2001, I (Swift) was notified by authorities from the Palpa Museum that they had discovered in situ an engraved stone displaying dinosaurs and other animals. It had recently been excavated from a Nazcan tomb complex that was dated between 400 and AD 700. This burial site is located at the far northern end of the Nazca Desert, just past the popular Nazcan Lines. The simplistic sauropod dinosaur on the stone is somewhat obscured by the extensive patina and not as detailed as most of the Cabrera Stones. There were about 30 eye witnesses to the stone's discovery, including museum staff archaeologists. The tomb is located beside an irrigation ditch near Rio Grande Palpa, a river valley where it was exposed to an unusual amount of moisture. Because of

**Figure 5.** A photo of the head of the dinosaurian figure on the museum stone showing extensive patina buildup

**Figure 6.** A sketch of the dinosaurian figure carved onto the museum stone

that, there is an unmistakable patina, along with the typical film of oxidation.

Knowing my interest in Ica Stones containing dinosaurian representations, the Museum officials allowed me to examine and photograph this Nazcan burial stone (figures 4–6). Eventually, I was even able to secure permission to take their remarkable artifact to the United States for analysis. Moreover, the museum staff documented the details of this Ica Stone's discovery for us in writing (see appendix 1[14]). Having possession of Ica Stones from each category (the souvenir stone from Uschuya, the Cabrera Stones of unknown provenance, and the museum stone of known provenance from the Palpa Museum staff), I explored whether there was a reliable way to discriminate between these categories, an independent test to authenticate the Ica Stones. If such a methodology could be established, this would be a powerful tool for evaluating the extensive Cabrera collection, including those stones of unknown provenance displaying unmistakable dinosaurian carvings. The most common way to validate purported antiquities originating in a desert environment is to employ a lab that has experience in evaluating for authentic patina.

## Patina testing

All three stones (each containing dinosaurian engravings) were submitted to Mason Optical, Inc. in Hillsboro, OR, for initial analysis (table 2). The lab conducted an independent blind test on the three stones. The souvenir stone was clearly established as a recent production, with no authentic patina buildup in the angled incisions. Careful analysis by their specialized jumbo hospital stereoscopic microscope even detected blue metal flakes in an incision—undoubtedly traces of Basilio Uschuya's hacksaw blade.

The analysis of the Cabrera stone of unknown provenance revealed a fine patina, embedded dirt, and natural oxidation, solid evidence of authenticity. The lab report stated: "These stones have been engraved with drawings. The incision of the drawings had a patina film over them. Therefore, they could not be of recent origin." In addition to those age indicators, the museum stone displayed extensive salt peter buildup and even a lichen growth on one section of the stone. The report concluded: "Patination is a relative dating method and is not absolute. These stones could have been engraved 500 years ago, 2000 years ago or earlier, but definitely are not modern."[15]

While this lab report was pretty definitive for the artifacts tested, there still remained a significant degree of uncertainty concerning how well this test would work for the many Cabrera collection artifacts. Most of the stones of unknown provenance, including those with obvious dinosaurian depictions, display very little patina (as Ryan Drum had observed). In very arid conditions (less than an inch of rainfall per year in the Ocucaje), it is not uncommon for genuine artifacts to have little or no patina, even after many centuries.[16] And, as the lab report itself concluded, "Patination is a relative dating method".

## Metallurgical test hypothesis

A second lab analysis was undertaken, utilizing a completely different authentication methodology. The same three Ica Stones were submitted to a lab specializing in metallurgical analysis. Our hypothesis was that poor Peruvians would have utilized readily available modern tools like Ushuya had done if they were mass-producing Ica Stones for Cabrera. Ancient stone artifacts, on the other hand, would likely give evidence of a Bronze-Age production.

> "Compositional analyses can identify the alloys made by the ancient people, help in the authentication of items with uncertain origin (i.e. not excavated from

**Figure 7.** Nazcan bronze tools from tombs

**Figure 8.** Cabrera stone with arrows marking areas where metals were recovered

well-controlled archaeological environments), bring information on the employed metallurgical procedures, and, in the case of very ancient artefacts, provide hints about the raw materials [sic] provenance."[17]

Metallurgical analysis would not be influenced by any 'artificial aging' patina applied to fake stones either.

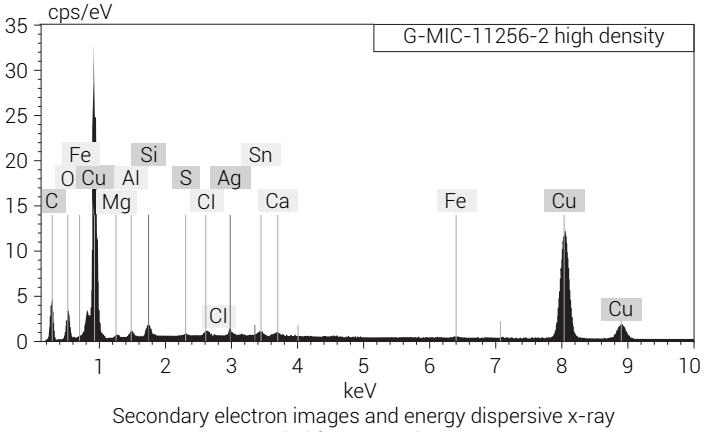
An analysis was commissioned utilizing Chemoptix Laboratory in West Linn, OR, and we submitted the same three stones for examination. The lab requested sample Nazcan tools for metallurgical comparison purposes. Fortunately, we were able to secure three implements of known provenance (figure 7). Here is a portion of the final lab report (see appendix 2[18] and table 2):

"The stone surfaces were examined in their entirety using dissection microscopes equipped with episcopic/incident light illumination (MIC). Incision (carved) regions showing possible reacted metal were tape-lifted using carbon tape and analyzed via scanning electron imaging and back scattering (SEM/EDX).

"This stone [museum stone] showed weathering in its carved incisions on all examined surfaces. On a single planar surface, MIC analysis showed the rock-building minerals altering into secondary mineralization with similar habit but exhibiting expanded volumes related to alteration within the incisions … . No relict abrasions, metallic or otherwise, were observed in the incisions on this stone. No metallo-oxide/hydroxides derived from iron nor copper were observed.

"This basaltic stone [stone of unknown provenance] showed small areas of copper mineralization loosely adhering to the regions of carved incision. The stone incisions also showed abrasion from incision. Although the stone indicated general protection from weathering, copper residues were severely weathered. Nonetheless, a few intact metallic fragments were observed [figure 8]. SEM/EDX [Scanning electron microscopy with energy dispersive X-ray spectroscopy] analysis indicated both scuffing morphology and spectra for a silver-bronze [figure 9]. Weathered zones adjacent to these particles also showed spectra suggesting derivation from this metal; those further from the metal scuffs presented spectra less relatable to the scuffs and indicating a more complex mixture of matrix elements and possibly limited diffusion. Perhaps significantly, no arsenic was recovered from the metal scuffs nor the adjacent weathered regions.

"The 'weathering' on this stone [souvenir stone]




Secondary electron images and energy dispersive x-ray spectrum acquried from sample G MIC-11256-2.

**Figure 9.** EDX spectrum from metal that was recovered from the Cabrera Stone, showing characteristic X-ray peaks that indicate a sample's elemental composition

**Table 2.** Summary of Ica Stones analyses

| Category | Description | Provenance | Patina Testing | Metallurgical Testing |
|---|---|---|---|---|
| **Rio Grande Palpa *Museum Stone*** | 17.8 cm long, 24.1 cm wide, and 10.8 cm high. Weighs 8.79 kg. Mohs hardness of 5. | Found in situ by secular museum archaeologists | Heavy patina, extensive salt peter buildup and even a lichen growth | No relict abrasions, or metallo-oxide/hydroxides derived from iron or copper seen |
| **Cabrera *Stone of Unknown Provenance*** | 21.6 cm long, 20.3 cm wide, and 17.1 cm high. Weighs 14.63 kg. Mohs hardness of 5. | Allegedly found in Paracas tombs by Huaqueros | Fine patina, embedded dirt, and natural oxidation | Weathered copper metallic fragments were recovered from a silver-bronze. |
| ***Souvenir Stone* made by Basilio Uschuya** | 20.3 cm long, 12.7 cm wide, and 5.7 cm high. Weighs 2.8 kg. Mohs hardness of 3. | Recently manufactured | no patina buildup and blue metal flakes seen under the microscope | Cursory exam showed a brushed on coating, but no metal recovered for analysis |

peripheral to the incised figures was brushed on as a paint/coating. There were no conspicuous metal/metallo-oxides within the incisions upon cursory MIC evaluation."[19]

## Discussion

It might seem odd that the museum stone of known provenance did not yield any metal remnants whatsoever for analysis. But we feel this fits with the extensive patina and lichen buildup from the more humid environment. The presence of moisture and the great antiquity of the artifact likely resulted in the complete corrosion of any residual metals. Any remaining corrosion remnants probably are embedded under the thick patina. This scenario is hardly unprecedented.

> "Swedish researchers recently carried out a detailed statistical study that examined aspects of bronze corrosion and the burial environment for artifacts from the Bronze Age, the Viking period, and the early Middle Ages (Mattsson *et al.*, 1996) … . Soil moisture was shown in the Swedish statistical work to be a significant influence on copper deterioration in burial environments. This corrosion is promoted in artifacts by deep burial (but still above the water table); by burial at low height above sea level for coastal material; by small pour size in the surrounding soil; and by burial in a barrow (burial mound)."[20]

The absence of arsenic and only trace amounts of tin detected in the stone of unknown provenance (from Cabrera) is a very positive indicator of antiquity. Early Bronze Age tools were simply made from 'dirty copper', typically annealed and beaten into shape. As metallurgy advanced, "Copper alloyed with small quantities of arsenic, lead, antimony and tin appeared during the Eneolithic, indicating the first attempts of prehistoric metallurgists to improve the technical characteristics of native copper."[21] Later Bronze Age workmanship consistently involved the addition of controlled amounts of arsenic and eventually tin to the smelted copper to increase the hardness of the final bronze product.

> "The bronze alloys of copper-arsenic and copper-tin were a phenomenon of the late Middle Horizon and Early Late Intermediate Period (ca a.c. [sic] 900–1100) in the Central Andean culture. They were not the first copper-based alloys to be developed in the Andean region; the alloys of copper-silver and copper-gold long preceded them."[22]

In ancient Peru, arsenical bronze was the most common in northern and central regions because of the rich arsenic bearing ores present there. The south and central Andes (including the Nazca region of southern Peru) were rich in the tin ore Cassiterite. By AD 1500 the Incas had disseminated the more advanced tin bronze throughout their South American empire.[23] Modern bronze is anywhere from 5% tin (a mild bronze) to 25% tin (in brittle bell metals) with about 12% being the most common.

The metallurgy of the bronze tools discovered in the Nazcan tombs was also analyzed by Chemoptix. None of them precisely matched the composition of the metal bits found on the stone of unknown provenance. One tool contained the silver but none contained the tin traces. Thus, they did not exactly match each other either. This result is consistent with the belief that these tools were produced during the Early Bronze Age, when impurities and uncontrolled alloys made for variations in bronze implement composition. Still today, profitably mining the extensive Peruvian copper ore deposits is difficult because of its varied impurities, especially arsenic.[24]

While the metallurgical authentication results for this stone of unknown provenance are quite impressive, an

important question remains. Could it be a modern stone production that was manufactured with Bronze Age tools? We think this to be extremely unlikely for a few reasons. Cabrera was not performing any of the analysis that we did as he bought stones (nor could he with the technology available at the time). Ancient bronze implements found in the tombs are rare and would most likely be sold quickly to a collector. If the Huaqeros were manufacturing Ica Stones en masse, it doesn't seem reasonable that they would have bothered to use ancient tools. Certainly Basilio Uschuya (who had supplied stones for Cabrera) did not do that when he produced the souvenir stone. Moreover, Early Bronze Age tools would have worn out long before the thousands of Cabrera Stones *could* have been manufactured.

We must also consider the possibility of contamination. The museum stone has been carefully handled by professional archaeologists. Heme iron from blood traces in the burial process could have been introduced before the archaeologists recovered the stone, but this wouldn't impact on the bronze profile analysis. We cannot be sure that the stone of unknown provenance was carefully handled and stored over the years. However, we feel it is very improbable that highly corroded bronze elements would have been introduced in such a way that they would adhere in the incisions.

## Conclusion

The next step in our research will be to utilize this same metallurgical analysis in attempting to authenticate Ica Stones of unknown provenance exhibiting dramatic, realistic depictions of obvious dinosaur species. It is hoped that lab tests continue to provide clear and consistent results as we proceed with the testing. Pre-Colombian burial stones have the potential to be powerful evidence that men and dinosaurs co-existed. While the Palpa Museum's in-situ discovery of an Ica Stone with extensive patina buildup that contains simplistic dinosaurian representations was a marvelously unique find; perhaps more significant is the development of a promising methodology to authenticate the numerous dinosaurian Ica Stones of unknown provenance.

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# Which Persian monarch was the Ahasuerus of the Book of Esther?

*James R. Hughes*

Among Bible scholars who accept the book of Esther as historical, it is generally believed that the Ahasuerus of Esther was Xerxes I. The primary reason is an apparent word association between the name Ahasuerus and the Old Persian word *xshayârshâ*. However, there are a number of reasons for equating Ahasuerus with Darius I (Hystaspes), the father of Xerxes I, including the fact that Darius spent considerable time in Susa, where he built a significant palace, whereas Xerxes did not spend much time in Susa, but in Persepolis. Events in the life of Darius can be correlated with dates for events given in Esther more closely than the events in the life of Xerxes.

The name Ahasuerus, used to designate a Persian monarch, appears only in the Hebrew Bible. It occurs many times in the book of Esther and only in two other places (Daniel 9:1 and Ezra 4:6). The Ahasuerus mentioned in Daniel 9:1 cannot be the same Ahasuerus as the one mentioned in Esther, since the Ahasuerus of Daniel 9:1 was the *father* of Darius the Mede. Whereas the rule of the Ahasuerus of Esther is later (either 522–486 BC or 486–465 BC, as traditionally dated[1]). The Ahasuerus mentioned in Ezra 4:6 is also probably not the king mentioned in Esther. He is probably Cambyses II, the son and successor of Cyrus.[2]

Who was the Persian king mentioned in the preface of the book of Esther (and throughout the book) by the name Ahasuerus? He was a king of the Persian Empire at its peak, since he was the ruler of 127 provinces from India to Ethiopia (Esther 1:1). Various Persian monarchs have been proposed since before the time of Christ (e.g. in the Apocrypha and LXX, which translates 'Ahasuerus' as Artaxerxes). Statements in Esther relating to the extent of the Persian territory (1:1), establishment of Susa as a residence for the royal throne (1:2), appointment of seven princes (1:14), and taxation of the coastlands/islands (10:1) rule out monarchs *prior* to Darius I.

The overwhelming consensus among most modern commentators is that Ahasuerus was the Persian monarch named Xerxes I (reigned 486–465 BC), the son of Darius I (reigned 522–486 BC)—a different Darius from the one mentioned in Daniel (5:31; 6:1ff; 9:1; 11:1). Some commentators state that there can be no doubt about this identification. The translators of the NIV assume this identification and include the name Xerxes in the translated text of Esther. This view appears to have first been suggested by Joseph Scaliger (1540–1609), a Dutch scholar, in his work on historical chronology.[3] James Ussher (1581–1656) took a different view than that of Scaliger, and understood Ahasuerus to be the father of Xerxes I—i.e. Darius I.

There are primarily three arguments presented in favour of Xerxes being the monarch of Esther:

1. The extra-biblical events recorded about Xerxes' reign[4] can be correlated with the dates of Ahasuerus's reign given in Esther. It has been suggested that the feast recorded in chapter 1 falls within the period of Xerxes' preparation to avenge his father's defeat at the Battle of Marathon (490 BC) against the Greeks. The feast may have included planning sessions with the leaders (subject kings and satraps) of the provinces called to Susa, and provided an opportunity to solicit financial support for the costly undertaking of staging a fleet and army to attack Greece. However, when Xerxes was in Persia he spent most of his time in Persepolis, not Susa, where the events of Esther take place, over a 10-year period. The use of Susa as a royal residence declined after Darius I until the time of Artaxerxes II.[5] There is no evidence that Xerxes spent much time in Susa.[6] After Xerxes' navy was defeated at Salamis and he returned to Persia, he could have then married Esther in the seventh year (2;16) of his reign (479 or 478). However, the fact that he would have been away in Greece the year before (2:12) presents a difficulty for explaining how he agreed to the decision to collect virgins for his harem (2:1–4).
2. It has been suggested that Herodotus refers to Xerxes' capricious and tyrannical nature, and that this is consistent with the nature of Ahasuerus described in Esther. However, Herodotus was a Greek, with no love for the Persians. He attributes harshness to many enemies of the Greeks.[7] And, the same character traits attributed to Xerxes can be attributed to other Persian (and before them, Babylonian; and after them, Greek and Roman) monarchs. Such is the nature of man that when he is allowed to have absolute power and is permitted to be worshiped as a god, he will behave in a tyrannical manner—one only needs to consider Kim Jong-un, the 'supreme' leader of North Korea to see this reality.

3. Roland G. Kent, a linguist at the University of Pennsylvania, translated many of the cuneiform inscriptions from the period (e.g. on pillars, stone slabs, walls, and statues in the ruins of Susa and Persepolis). In the cuneiform, Xerxes refers to himself as, *xshayârshâ xshâyathiya*,[8] which is translated by Kent as 'Xerxes the King'. It is claimed by some OT scholars that the name Ahasuerus is a Hebrew approximation of the Old Persian *khshayarsha* (*xshayârshâ*). However, a previous Persian (or Median) monarch, named Cambyses I, was also called Ahasuerus in the biblical text (Daniel 9:1). He was the father of Darius the Mede (likely, Cyrus the Great). There is no evidence that his name was Xerxes.[9] It is likely that the Ahasuerus mentioned in Ezra 4:6 is also a different one than is mentioned in Esther.[10] The term *ahasuerus* (if it is a transliterated approximation of the Old Persian *xshayârshâ*) is believed to mean 'mighty man' or 'mighty eye' from '*aha*' and '*suerus*'; which can equate to '*arta*' and '*xerxes*' ('Artaxerxes'), as the name Ahasuerus is translated in the Septuagint in Esther 1:1. If this is the case, then Ahasuerus could be translated into English as 'Artaxerxes', but not as 'Xerxes'. It may be that some of the OT writers used the name Ahasuerus as a generic name for any Persian monarch. The writer of Esther demonstrates this with the statement "in the days of Ahasuerus, the Ahasuerus who reigned …" (1:1). This is equivalent to saying, "in the days of the king, the king who ruled …". There had never been a Xerxes in the Medo-Persian Empire prior to Xerxes I. From a Jewish perspective, the name Ahasuerus appears to have been a title for the Persian monarchs rather than their personal names, as the name Pharaoh (the Hebrew equivalent of the Egyptian '*pr-'o*' meaning 'great house') was used in the OT to refer to many Egyptian kings, regardless of their personal names. We use the appellation 'Caesar' in a similar way.

The other likely possibility for Ahasuerus is the monarch Darius I Hystaspes[11] (reigned 522–486 BC), the father of Xerxes I. There are a number of reasons for accepting this identification:

1. 1 Esdras 3:1–2 (in the Apocrypha) uses the name Darius as the king who reigned over 127 provinces from Egypt to Ethiopia; as did the Ahasuerus of Esther (Esther 1: 1–3).
2. Equating Ahasuerus with Darius I, rather than with Xerxes I, is supported by the association of the name Artaxerxes with Darius I in Ezra 6:14. If we translate the 'and' as 'even',[12] then Artaxerxes is Darius I, which supports the suggestion of Roland Kent that the name Ahasuerus is a Hebrew approximation of the name Artaxerxes.
3. The timing of events in the life of Darius I, from extra-biblical sources, can be correlated with the dates in Ahasuerus's reign given in Esther:
   - With the help of six princes (possibly six of the seven mentioned in 1:14) Darius seized power from the usurper Gaumata and ascended the throne in 522 BC.[13] He was occupied during the first few years of his reign with subduing revolts in the provinces and reconquering the empire founded by Cyrus.
   - During this time he married Atossa (Vashti; Bishop James Ussher, in his *The Annals of the World*, equates Atossa with Vashti[14]), a daughter of Cyrus, and fathered a son (Xerxes) by her (518 BC[15]).
   - Darius built a significant palace in Susa (figure 1)[16] and appears to have been in the city in 519 BC[17] in the third year of his reign, which correlates with Ahasuerus being in Susa in the third year of his reign (1:3).
   - After the deposition of Vashti, Darius had to leave Susa to deal with a rebellion in Babylon. He conducted a siege of Babylon and recaptured it (519 BC). After his return from Babylon he again spent some time in Susa. During this stay, a decision was made to collect virgins

**Figure 1.** Wall frieze from Darius's palace in Susa where Esther lived

**Table 1.** Correlation of events in the Life of Darius I with events in the Book of Esther

| Verse Reference | Event in the Book of Esther or Life of Darius | Year of Ahasuerus's Reign | Month(s) | Day(s) | Date (BC) |
|---|---|---|---|---|---|
| | *Darius seized power from the usurper Gaumata* | | | | 522 |
| | *Darius married Atossa, daughter of Cyrus* | | | | 521 |
| 1:3–4 | Ahasuerus held *banquet* that lasted 180 days | 3 | | | 520–519 |
| | *Darius began building the palace in Susa* | | | | 519 |
| 1:19 | Vashti deposed | 3 | | | 519 |
| | *Darius left Susa to subdue a rebellion in Babylon* | | | | 519 |
| | *Xerxes I born to Atossa* | | | | 518 |
| 2:16 | Esther declared queen | 7 | 10 | | 516 |
| | *Darius left Susa to invade Scythia and 'India'* | | | | 515 |
| 3:7 | Haman had the lots cast against the Jews | 12 | 1 | 1 | 511 |
| 3:12 | Haman issued his decree | 12 | 1 | 13 | 511 |
| 3:13 | Date planned for the annihilation of the Jews | 13 | 12 | 13 | 510 |
| 8:9 | Mordecai issued his decree | 12 | 3 | 23 | 511 |
| 8:12; 9:1 | Date upon which the Jews could defend themselves | 13 | 12 | 13 | 510 |
| 9:6–22 | Sons of Haman executed; Purim celebrated | 13 | 12 | 14, 15 | 510 |

for his harem (2:1–4), and a year later (2:12) Esther was brought to him and appointed queen (516 BC).

- He then left for a couple of years to invade Scythia and to expand the empire along the banks of the Indus River (1:1) in 515 BC.
- After his return, Haman put forward his proposal to eliminate the Jews. Esther had not been called into Ahasuerus's presence since he had returned from his conquests.

4. The extent of the Persian Empire was at its greatest during the reign of Darius I. According to Thucydides,[18] Darius subjugated the islands of the Aegean Sea. In an inscription at Susa, Darius said, "By the grace of Ahuramazda, here are the peoples I have conquered outside Persia. They obey me; they bring me *tribute*. What I order them to do, they accomplish. They respect my law: ... the *Greeks who guard the sea* ... ."[19] According to Herodotus, a taxation of the coastlands/islands was imposed by Darius I: "Later in his reign the sum was increased by *the tribute of the islands*, and of the nations of Europe as far as Thessaly. The Great King stores away the tribute which he receives after this fashion—he melts it down, and, while it is in a liquid state, runs it into earthen vessels, which are afterwards removed, leaving the metal in a solid mass. When money is wanted, he coins as much of this bullion as the occasion requires."[20] Esther 10:1 refers to such a tribute. However, this territory was lost by Xerxes I after his defeat by the Greeks in 480 BC after the Battle of Salamis, *before* the book of Esther would have been composed, if the monarch of Esther was Xerxes I.
5. According to Herodotus, it was Darius I who, on his arrival at Susa, founded the council of the seven princes of Persia (1:14).[21]
6. There is no evidence that Amestris, the wife of Xerxes I, was ever deposed or viewed unfavourably by Xerxes. She continued to have significant influence when her son, Artaxerxes I, became king. In contrast, there may be an indication that Atossa was deposed or viewed with less favour by Darius I. Darius married Atossa, the previously twice-married daughter of Cyrus, for political reasons—to consolidate his claim to the throne. Atossa was one of the many wives of Darius, and, according to Herodotus, not his most favoured. His most favoured wife was the virgin Artystone—Herodotus states that she was a younger daughter of Cyrus[22] but Ussher suggests that she was Esther (2:17), whose Jewish origin was concealed by the Persian chroniclers. Darius honoured Artystone by making a golden statue of her.[23] Even though Atossa was the mother of Xerxes, she is rarely mentioned in the *Persepolis Fortification Tablets*,[24] but Artystone (Irtašduna, in the *Fortification Tablets*) is mentioned as an influential woman who owned great estates (8:1).[25] This may indicate that Atossa had lost favour with Darius, as the book of Esther indicates of Vashti (1:19–22).

7. The names of the eunuchs, Bigthan and Teresh, who plotted against Ahasuerus (2:21) are given as Gabatha and Tharra in the Greek apocryphal portion of Esther (12:1), in the days of Mordecai (Mardocheus in the Greek). Mordecai informed *Artaxerxes* of the plot. This same Artaxerxes ruled over 127 provinces from Egypt to Ethiopia (apocryphal portion of Esther, 13:1), as did the Ahasuerus of Esther.
8. One of Haman's sons is named *Vaizatha* (9:9). Yamauchi refers to linguistic studies which concluded that the diphthong[26] '*ai*' had shifted to '*e*' between the reign of Xerxes I and Artaxerxes I. "This indicates that the name transmitted in Esther is strikingly old and authentic."[27] This is evidence that the book of Esther was written by a contemporary of Esther and not during the late Hellenistic era, as is often suggested. In addition, it suggests that Esther was composed in Hebrew during (or shortly after) the lifetime of Darius I rather than that of Xerxes I.
9. We are told that Mordechai was taken captive at the time of Jeconiah (597 BC) in Esther 2:6. If we date Ahasuerus as reigning from 486–465 BC, then Mordechai would have been at least 124 years old when he was promoted to prime minister (8:1–2) in Ahasuerus's13th year (473 BC). However, if he was promoted by Darius I, he would have been about 88 years old; a more realistic age for an elder sitting at the king's gate (2:19).

## Conclusion

This analysis of the historical evidence appears to indicate that Ahasuerus, the husband of Esther, was Darius I, not Xerxes I as is commonly believed today among Evangelicals.

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3. Tyrwhitt, R.E., *Esther and Ahasuerus: An Identification of the Persons So Named* ..., Burntisland, Scotland, p. 3, 1868.
4. Identifying exact dates for most of the events in the lives of Persian monarchs is difficult. Dates for specific events may vary, depending on the source consulted.
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6. Perrot, ref. 5, pp. 454, 461, 464.
7. Baragwanath, E., *Motivation and Narrative in H*erodotus, Oxford University Press, 2008.
8. *Old Persian Texts*, www.avesta.org/op/op.htm.
9. Based on this suggested word association, the NIV translates Ahasuerus as Xerxes in Daniel 9:1. However, there is no evidence that the name, translated as Xerxes, was used by the Medes prior to the consolidation of the Medo-Persian Empire under Cyrus. In addition, Xerxes I (518–465 BC) could not have been the father of the Darius (Cyrus) of Daniel, who was 62 years old in 539 BC (Daniel 5:31). The NIV translation introduces unnecessary confusion by translating Ahasuerus as Xerxes.
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11. See, Jones, F.N., The identity of Ahasuerus in the Book of Esther; in: *The Chronology of the Old Testament*, Master Books, Green Forest, AK, pp. 199–205, 2009.
12. Austin, ref. 1.
13. en.wikipedia.org/wiki/Darius_I; see: Herodotus, *The Histories*, book 3, chapter 84; www.perseus.tufts.edu/hopper/text?doc=Hdt.+3.84&fromdoc=Perseus%3Atext%3A1999.01.0126, accessed 29 June 2016.
14. James Ussher, *The Annals of the World,* archive.org/stream/AnnalsOfTheWorld/Annals_djvu.txt; sections: 1009, 1027, 1035, accessed 29 June 2016.
15. If Xerxes was born in 518 BC (some place his birth in 520 BC), this could appear to present a problem for the identification of Ahasuerus as Darius, since Vashti was deposed before Xerxes was born. However, the banquet lasted 180 days (1:4). It may have been started in late 520 BC and continued into 519 BC. If Xerxes was conceived near the end of the banquet period, he could have been born after his mother was deposed as queen, in 518 BC.
16. Jean Perrot (Ed.), John Curtis (Introduction), *The Palace of Darius at Susa: The Great Royal Residence of Achaemenid Persia* (I. B. Tauris, 2013).
17. Perrot, ref. 16, pp. 411–412.
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20. Herodotus, *The Histories*, book 3, chapter 96; mcadams.posc.mu.edu/txt/ah/herodotus/Herodotus3.html, accessed 29 June 2016.
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25. www.livius.org/da-dd/darius/darius_i_4.html, www.livius.org/arl-arz/artystone/artystone.html, accessed 29 June 2016.
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# Origins of pathogenic microbes: part 2—viruses

*Warren A. Shipton*

From creation the ecosystem was stable and microbes participated in maintaining the homeostatic state. The basic types of microbes, including selected viruses, appear to have been created. Sin apparently brought a change to features of DNA repair and gene regulation in living systems and also stress was introduced into the equation. This resulted in mutations and other errors giving rise to cellular malfunctions. Hypotheses based on published data are presented to account for the emergence of the different categories of viruses. On the basis of genome similarity, horizontal transfer of genetic information apparently occurred among living organisms, which helps to explain viral diversity. Some potential exchange mechanisms have been identified, but new ones are likely to be discovered. Alternatively or in addition, a modification of original creation designs is being attempted by one who said "I will be like the Most High" (Isaiah 14:14). Some of the outcomes observed could represent a cunning reworking of the original genetic information to achieve results not previously imagined—as achieved by humans in their genetic engineering experiments. Via these processes, new pathogens may still be emerging. Versions of the theory of evolution commencing with viruses depend on a number of 'miraculous' events for their success. By contrast, the biblical story of creation appeals to Creation Week events and the disruption caused by the Fall.

In the part 1 of this article, the origin of bacterial pathogens was considered. The involvement of viruses in bacteria acquiring pathogenic capabilities was mentioned. In this section, the origin of viruses will be discussed in detail. Viruses, particularly bacteriophages, represent the most numerous biological entities found in the natural world.[1] The basic proposition used in this article is that microbes were not disease-causing initially in creatures with pain sensations. Bacteriophages (phages) are considered part of the original creation plan, for they carry out many significant functions in the bacterial world. Change after the Fall conceivably involved shifts in the ecosystem balance so that the nature and behaviour of organisms was altered. It is also postulated by some that an agent(s) altered or added novel genetic information to the genome of existing organisms after the Fall or an entirely new line of microbes was created (as part of God's curse).[2]

The existence of beneficial phenomena in the natural world that are widely expressed will be taken to indicate their essential continuity from the beginning (parsimonious approach), except where biblical information dictates otherwise.

## Origin of viruses

The origin of viruses is uncertain. In the evolutionary scheme they are sometimes seen as the commencing building blocks of life, which requires a series of miracles to accomplish.[3] This view is rejected here. Virus genetic material is made of RNA or DNA. Creationists have adopted a number of approaches to their origin: viruses, or at least some, were created; they arose from existing elements and structures through naturalistic means; guided change was responsible; or a combination of these phenomena occurred.

Viruses, transposons (DNA sequences capable of changing position), and plasmids (small extrachromosomal DNA molecules) display some similarities, but no single gene is shared by all groups. However, there are different groups of shared genes that form links among these elements. This could indicate that exchange of genes may have occurred as well as host gene incorporation into some elements. Host gene incorporation is seen particularly in viruses with large genomes.[1] The proposition forwarded in this paper is that the limited number of virus hallmark genes that have been identified may be taken to indicate that some basic virus forms were present from creation. The variants observed today arose from these basal types.

### Created or basic types created

The concept that viruses were part of the original creation is sometimes promoted. The idea is that they, as with the more regular microbes, were made to contribute to the operation of the ecosystem and confer benefits on invertebrates and higher-order hosts.[4] The proposal that viruses, in general, were in useful relationships with the entire creation before sin has limited observational support. Examples of beneficial relationships involving viruses (other than bacteriophages or phages—see below)

include parvoviruses that enable wing development in aphids, parvoretroviruses of plants that protect against pathogenic viruses, and a mycovirus able to confer plant thermotolerance.[5] Some parasitic wasps are dependent on viruses for their success. For example, an ascovirus in the wasp *Diadromus pulchellus* inhibits the deposition of melanin by the leek moth larvae (*Acrolepiopsis assectella*) that would normally encapsulate the wasp's eggs and prevent their development. Other wasp viruses may act similarly.[6] However, for plants and mammals, it has been difficult to identify benefits flowing from viral infection. Suggested examples are plant drought resistance and protection from other viruses and, in mammalian hosts, protection from damaging viruses.[5] In some mammals another example is the expression of amylase activity in saliva, which confers adaptive advantages. This activity is facilitated by the presence of retrovirus elements.[7]

Others reject a creation origin for viruses due to the ill repute with which most viruses are held, their classification as non-living entities[8] (some experts only), the concept that there was no death in Eden, that ecological balance is possible in the absence of such a culling process involving bacteria, and that all negative outcomes are attributable ultimately to Satan.

An intermediate view is that creation of special viruses occurred rather than the general creation of viruses. The mildest version of such an approach is to regard some asymptomatic animal and plant viruses potentially in this category. Indeed, it is noted that plants cannot be cured of their cryptic viruses (partitiviruses–function unknown).[9] There are also asymptomatic viruses among the insects, which have no known function.[10] Among the bacteria, phages (figure 1) ostensibly were made to assist in the control of explosive bacterial growth for the maintenance of ecosystem balance. Phages are widespread, function to improve bacterial growth, protect against chemical agents and stress, assist in biofilm formation (an essential feature of bacterial life), and occasionally prevent pathogenicity and dampen mutation.[11] All these attributes represent benign, but very useful, features for bacterial existence. Some phages may function as plasmids,[12] which seems to hint at their essential role. The argument for the creation of some categories of viruses may be strengthened on account of the cogent reasons given supporting the concept of death among the non-feeling organisms in Eden before the entrance of sin.[13]

The argument in favour of some basic virus types being created appears to stand on stronger ground than other proposals. It also has the benefit of denying Satan creation credentials. This means he would be restricted to manipulating that which was created.

The following brief account of virus origins takes evidence from scientific work published in refereed journals. Some of these papers argue that eukaryotes arose from simpler forms of life whereas others champion the idea that viruses were derived from the genomes of their hosts. The concept adopted here is that in the beginning there was a near-simultaneous appearance of life-forms from the Creator's hand. After sin entered, massive alterations appeared. This implies that microbes have adapted to changing conditions to give pathogens by exchange and recombination of existing information. The scientific evidence, when paired with this concept, leads to a reasonably satisfying fit.

## Naturalistic derivation from existing elements

The processes occurring in nature are treated in this section, although a number of concepts are logical suppositions not yet supported by hard evidence. Hypothesis making precedes evidence gathering in the scientific endeavour, which means that propositions are refined over time.

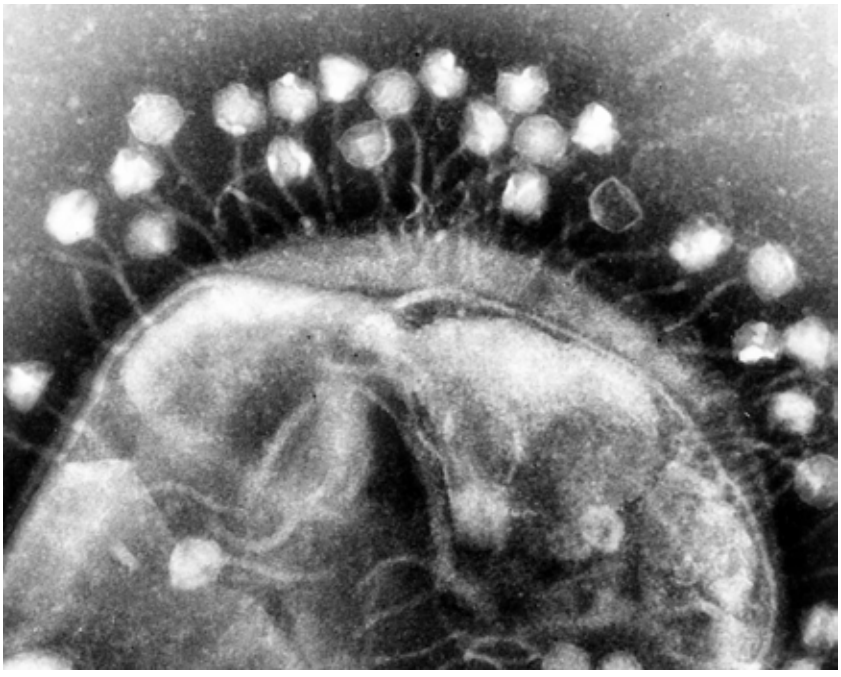

**Figure 1.** Bacteriophages or phages attached to the surface of a rod-shaped bacterium. The nucleic acid in the apex of the phages ultimately will be injected into the bacterium.

Two types of nucleic acid are possessed by viruses requiring somewhat different emphases. First there is the ribonucleic acid (RNA) group and secondly the deoxynucleic acid (DNA) group. Some of the viruses in the latter group show similarities to genetic elements in the genome of living organisms, such as retrotransposons. These represent mobile elements that have other representatives too—transposons and other elements. Such pieces of genetic information may constitute up to 45% of the human genome and 37% of the mouse genome. Only a small group (80–100) of those present in a mammalian genome can move and influence the behaviour of other pieces of DNA (retrotransposons). They are responsible for genetic diversity, which includes diseases caused by insertional mutagenesis. Some of these retrotransposons are regarded as endogenous retroviruses[14] due to selected retrotransposons possessing many features similar to those displayed by retroviruses (HIV is a member of this group).[8]

### RNA viruses

In RNA viruses, the hallmark protein (enzyme) is RNA-dependent RNA polymerase. The structural similarity among the different categories of RNA viruses—positive, single-stranded (+ss)RNA, negative, single-stranded (–ss) RNA, and double-stranded (ds)RNA—is high. However, no similarities of the gene are present in eukaryotes. In order to solve the issue of origins, it has been postulated that the +ssRNA viruses of eukaryotes arose from +ssRNA bacteriophages or a more remote possibility is from the limited RNA virus representative(s) of Archaea. In turn these viruses are thought to have given rise to the –ssRNA and dsRNA viruses. Horizontal virus transfer to other hosts and intermixing of elements then may have occurred. Such a scenario appears to have taken place with fungal and plant viruses in particular. This makes sense as fungal-plant interactions are common. The close relationship observed between some plant and fungal viruses suggests that mixing of elements has given rise to new virus derivatives. Other groups of +ssRNA viruses also display many genome similarities, which suggests that the spread of genes among plant viruses occurs commonly, giving rise to new variants.[1]

Another possibility is that new plant viruses could be made by transfer of information from the plant to the virus. RNA plasmids are found in animals, fungi, and plants and replicate similarly to selected RNA viruses. Such plasmids would need to acquire genetic information allowing a coating protein to be fashioned.[15] Evidence of such a scenario appears to be supported by studies with potato leafroll virus (+ssRNA). In one study, there was extensive similarity found in nucleotide sequences in potato leafroll virus and a tobacco chloroplast gene. This suggested to the investigators that recombination occurred between virus RNA and host plant messenger RNA.[16] Many viruses that are non-pathogenic for a particular host can replicate in the initial cells inoculated but cannot spread. It is in these cells that recombination theoretically could occur, conferring on the virus particle altered abilities. Indeed, invasive chimeric viruses have been generated in the laboratory when plants containing a segment of a plant virus genome are inoculated together with a related virus, even a non-infecting one.[17]

The –ssRNA viruses have narrow host ranges. The influenza A group of viruses (figure 2) have a segmented genome and illustrate rather well the capacity of segments from different sources to reassort and perhaps also mutate to create novel strains capable of causing deaths in the human and animal populations.[18] Besides chance spread of respiratory viruses across the species barrier via droplet transmission, the arthropod parasites of animals and plants appear to facilitate horizontal transfer of some other viruses. In fact, the protein sequences and architecture of –ssRNA viruses is similar in plants and animals. It is thought that these viruses arose from the +ssRNA viruses; a suggestion based on crystal structure similarities involving selected members of each group. There is also a possibility that dsRNA phages were involved.[1]

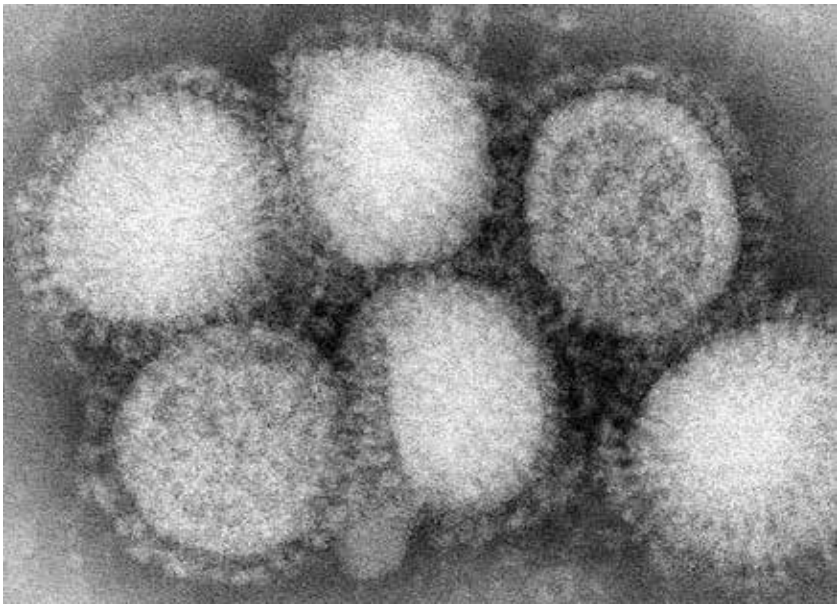

**Figure 2.** Electron micrograph of Influenza A virus

With the double-stranded RNA viruses, the cystoviruses (phages) appear to have contributed most of the structural genes found in dsRNA viruses occurring in eukaryotes. Again, horizontal gene transfer among plants, vertebrates and arthropods may have contributed to the emergence of distinctive virus lineages.[10] And there is some evidence that heritable information in a dsRNA virus-like particle (parasitic on a fungus) arose from RNA plasmids.[15]

Reverse transcribed elements in eukaryotes include the retroviruses. In these viruses, RNA is reverse transcribed into DNA. The only unifying feature of these entities is the reverse transcriptase feature. Some are able to integrate into the host genome, others behave as plasmids. Well-known retroviruses are infectious, but there are others that are inactivated by blockage of cell receptors because other retroviruses have integrated into the genome. Deletions and mutations also may render them inactive.[19,7] Retroelements are common in eukaryotes and are represented among prokaryotes, but they do not possess envelope-forming capabilities. However, these retroelements may be of more than passing interest as follows.

Virus-like particles may have been derived from retrotransposons. Viruses appear to have acquired the functional gene(s) for a virus envelope from some other source, possibly the host or other viruses.[20,1] Indeed, some retrotransposons carry envelope-like genes.[21] Hence, it is possible that the acquisition of a functional envelope gene may have resulted from protein domain fusion leading to the appropriate gene being formed.[20] Another factor involved in the genesis of a virus is its release from a host cell. These cells possess similar release phenomena to enveloped viruses, as noted in the formation of microvesicles. Such vesicles are produced by cells into spaces outside them.[22] The vesicles may carry a limited amount of DNA and some RNA,[23] which can include retrotransposon elements under stress conditions.[24] Microvesicles also are present in human milk, together with an array of microbial entities. It is conceivable that information transfer may occur in this environment.[25]

In summary, RNA viruses appear to have arisen in various ways. These may involve phages, host RNA (plasmids), retroelements present in hosts, and other RNA containing viruses. The mixing of virions in host cells gives the opportunity for variants to arise too. It seems possible that all these features could have arisen through the operation of naturalistic phenomena.

### DNA viruses

These viruses come as single-stranded (ss) or double-stranded (ds). I will commence the account of possible origins with the ssDNA viruses. The eukaryote ssDNA viruses replicate using a rolling circle mechanism initiated by the enzyme endonuclease. This method of replication is used by most of the prokaryote ssDNA viruses, many of the plasmids, and some transposons. On account of distinct structures in eukaryote ssDNA viruses, it appears improbable that they arose from similar viruses in prokaryotes. On the other hand, they share a number of significant similarities to bacterial plasmids (small DNA molecules replicating separately from the chromosome), suggesting possible origins from them.[1] This suggestion is made on account of a number of lines of evidence. One example is that the bacterium *Agrobacterium* is able to support geminivirus (plant virus) replication when its DNA is experimentally inserted into the bacterium. This is on account of the viruses containing bacterial promoter sequences.[26]

The conversion of a plasmid (figure 3) into a virus requires encapsulation of the nucleic acid by a protein coat and the acquisition of genetic information allowing intercellular transfer. The similarities between the structure of virus coat protein found in various viruses suggests that information transfer from bacterial plasmids and +ssRNA viruses has occurred, allowing the emergence of ssDNA viruses. Recombination events have been shown between RNA and DNA viruses so that the suggested marriage of plasmid DNA and RNA viruses is not outlandish. Indeed, since many bacteria are parasitic or mutualistic in eukaryotes and these may also be hosts to a variety of viruses, the opportunity for transfer and recombination exists. Genetic exchange could occur in cells infected simultaneously by both bacterium and virus. Such occurrences are known to occur.[27,1]

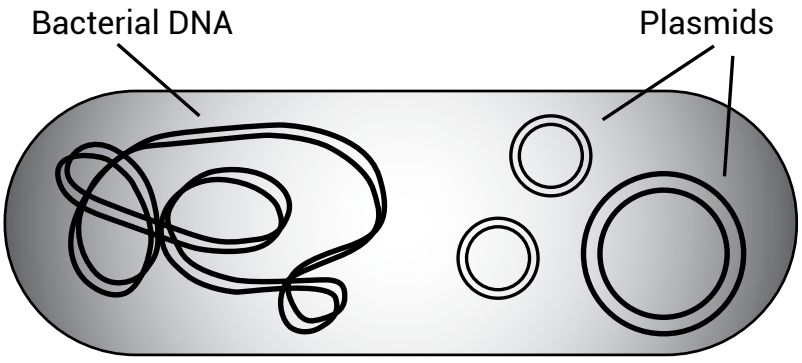


**Figure 3.** Plasmids and chromosomal DNA shown schematically in a bacterial cell

A greater amount of information is available on the possible origins of

dsDNA viruses. Double-stranded DNA viruses are widely distributed in the eukaryotes and may have arisen in a number of ways. The first possibility involves transposons, which are transposable pieces of DNA. Large transposons have been termed polintons. They contain proteins needed for their own transposition. It is hypothesized that they arose originally from a linear plasmid.[28] Most of these mobile elements contain two proteins similar to those found in the capsids of viruses residing in bacteria, archaea, and eukaryotes, and also contain additional proteins needed for virus development. This information can be interpreted to indicate that virions could arise from polintons under suitable conditions, [1,29] although this has not yet been achieved in the laboratory.

The origin of another category of viruses, the virophages, appears to involve polintons too. Virophages are small dsDNA viruses that reduce the replication capacity of a category of large viruses (mimiviruses). Genome analysis indicates that virophage genes share genetic information with the polintons.[29] They also show similarities to amoebal transposons and host genes as well as genes found in plasmids and bacteriophage.[30] This can be taken to suggest horizontal gene transfer involving a number of organisms and entities and that virophages could have descended from polintons.

Plasmid involvement in the origin of viruses also is indicated with the replication of poxvirus (vaccinia—dsDNA virus). Virus duplication in animal cells may use proteins required for the replication of selected plasmids. Furthermore, a common cytoplasmic area of the cell is used for replication of both the virus and plasmid.[31] This indicates the close similarity between what can be regarded as normal cell processes and those utilized by viruses. It also suggests that reassortment of genetic material present in cells could give rise to novel combinations characteristically found in selected viruses.

Turning to a different group of host organisms, a somewhat different set of circumstances may contribute to the emergence of viruses. Genomes from large viruses (dsDNA) contain homologues of genes found in their hosts, indicating that these genes have been transferred. For example, a large virus (mimivirus) found in amoebae (*Entamoeba/Dictyostelium*) contains proteins (serine/threonine kinases) apparently derived from its host. One plausible route for such exchange has been suggested. Amoebae can ingest other microbes and break down (lyse) these cell occupants thereby releasing nucleic acid into the cell environment and creating a DNA soup allowing the possibility for gene acquisition. How this exchange and rearrangement of DNA might be accomplished is not known.[32] However, the observation is that hallmark genes shared by many groups of viruses show similarities to cellular genes,[33] which suggest that viruses may have arisen from several cellular sources through horizontal gene transfer.[34]

Some dsDNA viruses, such as herpes viruses, appear to have arisen from bacteriophages.[1] In turn, some bacteriophages (dsDNA phages) may have been derived from double-stranded DNA molecules (plasmids) that can replicate independently of the bacterial chromosome. A single mutation can enable some phages to exist as plasmids.[35] Again, special antibiotic proteins termed bacteriocins may be phage-like in structure when they are released from the bacterial cell, which perhaps indicates recombination activity between plasmids and bacteriophage. Indeed, phage tail-like protein has been found within selected bacteriocin operons.[36] These observations indicate that movement and recombination of genetic material within bacterial cells enjoy a wide range of possibilities in today's environment. The dynamics of interactions among viruses is incompletely understood, but cells simultaneously infected with herpes (dsDNA) and retrovirus (RNA made into DNA by reverse transcriptase) allows integration of retrovirus genes into the herpes virus.[37]

In summary, DNA viruses appear to have arisen in several ways. These may involve transposons, plasmids, other eukaryote host genes, and phages. While no virus has been engineered in the laboratory from these starting materials, the suggestions made are based on similarities in genetic makeup and architecture among structures and a certain amount of experimental evidence indicating that a range of exchange, recombination, and reassortment of genetic information is possible. All these features appear capable of arising through the operation of naturalistic phenomena.

## Genetic manipulation

The biblical account of life in Eden and on the earth excluded pain, shedding of blood, and death through old age (Genesis 3:3; Revelation 21:4). This raises the issue of the origin of the changes that are observed today and whether naturalistic phenomena alone have been responsible for them.

### God-arranged change

Entrusting God with the privilege of making pathogens in a special creative act (curse) cannot be substantiated readily. God is loving, good, and incapable of evil (Matthew 19:17; James 1:13; 1 John 4:8). Thus, it seems implausible to some to argue that He created pathogens causing pain and suffering in feeling forms of life. God well understood evil's nature and could have generated it, but Jesus' statement "If

a kingdom is divided against itself, that kingdom cannot stand" (Mark 3:24, ESV) precludes this possibility. The magnificent design of the immune system, His instruction to the Israelites on how to maintain health, and providing knowledge to moderns on how to fight disease are all clear evidences of His good will.

Changes in the mismatch DNA repair system allowing mistakes in repair of DNA damage and such like may constitute part of the Curse mentioned in Genesis 3:17. Changes may have occurred as a result of cellular stress such as imposed by dietary and environmental factors. These stress factors are known to activate transposable elements and give rise to mutations and to change the way in which microbes interact with the host. Restricting access to the tree of life also may have contributed through limited access to significant nutritional supplements, as indicated by the field of epigenetics (study of gene expression not involving DNA sequence changes). Epigenetics has to do with gene expression levels and the factors that influence them, which primarily are dietary and environmental stress. These stress factors act through changes to DNA, such as adding a methyl group to the cytosine base of DNA, and by modifications introduced into histone (proteins associated with eukaryote DNA) and ultimately to chromatin structure. Genes can be silenced or activated as a consequence of these changes.[38] Finally, the general curse of death on all plants and creatures meant that much more organic matter was available for decay. In this cauldron, DNA of all types conceivable became available for re-assortment leading to the emergence of microbes with unusual capacities.

### Human interference

Humans are able to effectively manipulate genes—i.e. generation of crops high in targeted nutrients; creation of insect, herbicide, and virus-resistant crops; transfer of spider and wasp toxins to plants; and introduction of computer-designed novel proteins.[39] In addition, humans can alter the pathogenic capability of organisms.

Pathogenic ability can be acquired and lost. Recently, Dr Craig Venter's group manipulated the smallest free-living pathogen *Mycoplasma genitalium* in unusual ways. First, they synthesized the organism's genome in the laboratory. They then disrupted the gene that caused pathogenicity and finally inserted the artificial genome into yeast cells where it successfully replicated. This was followed by the replication of an artificial chromosome in a related bacterial cell robbed of its nucleus, so creating a semi-artificial microbe.[40] The gene involved with pathogenicity allowed the microbe to adhere to host cells, an ability that can be lost, or reduced, by mutation, or artificial manipulation.[41]

It is possible to block the expression of disease in plants through introducing silencing codes into the pathogen's genome.[42] Equally, disease-causing capabilities might be introduced through genetic engineering. Great advances are being made in taking functional genes and placing them in different organisms. Future advances propose the design of organisms to perform ordered tasks.[43]

Mechanisms present in created organisms can be copied and reworked into something positively sinister, such as is done in germ warfare. This has been accomplished with an animal influenza virus. The original virus infected humans but did not pass easily between individuals. However, targeted mutations of the virus particle made it an effective airborne entity.[44] This paralleled work with a pox virus some years previously. The virus was made highly damaging by incorporating mouse-derived molecules. It was then able to undergo uncontrolled replication causing death in the experimental mice, which normally were resistant.[45]

An unexpected recent discovery is that in the non-retroviral RNA virus (lymphocytic choriomeningitis) genetic material may hybridize with retrotransposon DNA. Such hybridization has been observed in the mouse. This observation raises the possibility that virus genes may be integrated into a mammalian genome and that humans could facilitate such an outcome in their own kind by using RNA virus vectors in gene therapy experiments.[46]

### Other interferences

After Satan failed to find majority support in heaven, he was expelled and denied significant interaction with heavenly beings (Revelation 12:7–9; Job 1:6–7, 2:1–2). This indicates that limits were placed on his activities just as limits were placed on his annoyance of Adam and Eve (Genesis 3:1–3). The forces of evil are permitted to work within the bounds set by God and His plan to bring the reign of wickedness to a just end (Psalm 34:7; Revelation 13:5, 7, 15).

Satan's power over nature is beyond human capabilities (Job 1:12–19; Psalm 8:5; Hebrews 2:7). He has the ability to manipulate diverse organisms as suggested in the account recorded in Job. At that time, Satan was able to induce experimental infection at will (Job 2:7). In understanding the latter phenomenon refer to my first article on the origin of pathogenic bacteria (e.g. staphylococci). It is also fruitful to refer to relatively recent community outbreaks where special environmental and contact conditions were shown to permit mass infection by *Staphylococcus* to occur.[47] These observations may be taken to indicate that Satan possessed advanced knowledge on microbial behaviour and ecology at the time of Job. The Bible also speaks of thorns and thistles arising as a consequence of sin (Genesis 3:18). One possibility is that thorn-like structures arose through directed crossing and mutations, as has been demonstrated experimentally in the laboratory.[48] Alternatively, they could have arisen through genetic manipulation. Such unusual

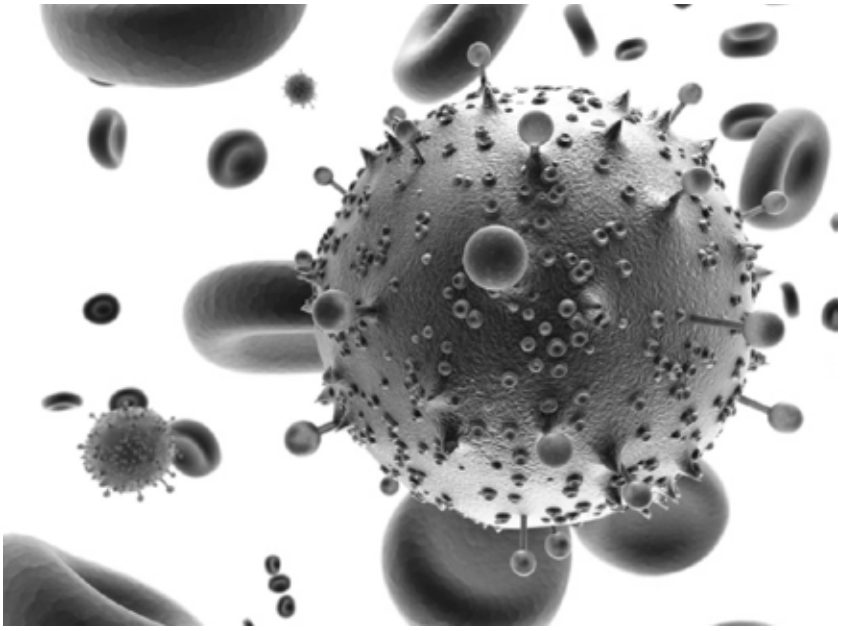

**Figure 4.** Artistic impression of a human immunodeficiency virus particle in proximity to a group of red blood cells

outcomes have been achieved through using both classical breeding methods and genetic engineering.[49]

Genetic engineering involves horizontal transfer of genes. It seems untenable to acknowledge Satan's great power over nature and his ability to perform the spectacular (Job 1:18–19; Matthew 4:8), which is well in excess of human capabilities, and then argue he cannot match human endeavours in the field of genetic engineering. Satan can alter existing information within limits, and he is at times able to use his human agents to do the unthinkable, as in biological warfare.[50]

After Satan's expulsion from heaven, it might be expected that he would disrupt God's creation and blame Him for the suffering caused, as creative ability is God's hallmark (Isaiah 42:5, 65:17; Colossians 1:16). One of my basic premises is that pre-existing structures and mechanisms have functioned as prototypes to devise malignant forms. Ingenious combinations and innovations among genetic resources, particularly involving opportunistic organisms, could have facilitated pathogenic organism generation. The emergence of some viruses might represent an engineered result. However, a strategy to detect such occurrences would be difficult if not impossible to devise.

## Genesis and expression of pathogenic capabilities

Virulence, the capacity to cause disease, is not strictly an intrinsic microbial characteristic but includes both microbial and host factors.[51] With viruses, which are technically non-living entities, features other than intrinsic characteristics are emphasized. In all considerations relating to pathogenic ability, the environment also can be highly significant.

## Microbe changes

The generation of pathogenic viruses from asymptomatic or defective ones is a possibility. Defective viruses integrated into the chromosome may give rise to pathogenic variants when recombinants form as a result of genetic exchange. This has been shown with a number of retroviruses and indicates that in the right circumstances, exchange of genetic information may take place without great difficulty.[52]

Virus may exchange information and even take genes from the host organism. This has been documented in the laboratory following the chance acquisition of a retrotransposon from insect cells into a baculovirus (dsDNA).[53] The resulting changes in host range, virulence, and other features of such an acquisition are unknown.

The emergence of human immunodeficiency virus (HIV—figure 4) from simian immunodeficiency virus (SIV) appears to be the result of two phenomena. One is transmission of SIV from monkeys to humans, thought to have occurred by contamination of fresh wounds by monkey blood during their slaughter for human consumption. The contaminating virus particles are thought to have possessed a limited capacity to replicate in human tissues. However, among the contaminants thus introduced a mutant apparently was selected conferring the ability to replicate well within human cells (second phenomenon). On an experimental basis, when HIV was used to infect simian hosts, a reverse mutational change was noted; that is, the virus now became adapted to growth in apes rather than in humans. This observation gives credibility to the suggested mechanism behind the host range extension seen.[54]

Other retroviruses may arise as a result of recombination events between those integrated into the chromosome or those external to it. This outcome is indicated by the identification of a unique avian leucosis virus.[55]

### Host changes

The best known example of host changes leading to disease manifestation is with immunocompromised

and immunosuppressed organisms. These hosts may be predisposed to attack by microbes not normally considered pathogens or by rare pathogens that flourish in unusual locations. Virus infection of the central nervous system fits into the latter category. An example is John Cunningham virus, which is capable of invading and causing disease of the central nervous system only when the individual is immunocompromised.[56] Influenza A viruses also disrupt the immune response of the host, leading to a more severe form of the disease, and predispose the host to secondary infections from other microbes.[57]

### Environmental influences facilitate emergence and expression

Changes in the environment may be responsible for the emergence and expression of virulence traits. For example, nutritional status may be a significant environmental variable in viral virulence. Mice infected with a strain of coxsackievirus B3, which under normal circumstances is not capable of causing disease, caused moderate to severe disease (myocarditis) when the animals were selenium deficient. Re-isolation of the virus from these animals and subsequent injection into animals with an adequate level of selenium demonstrated that the virus had been changed as a result of the exposure to altered selenium levels. In this case the virus became virulent as a result of mutations, a conclusion confirmed by genome sequencing.[58]

The methylation status of host nucleic acid influences the susceptibility and resistance of an organism to virus infection. For example, mice are predisposed to show a high frequency of thymic lymphomas when their nucleic acid is poorly methylated. This observation was made following the knockout of the gene regulating methylation. This change apparently led to genetic instability and activation of the retroviral elements.[59] In another example, involving chickens that contained a leucosis virus integrated into chromosomal DNA, abundant methylation was associated with resistance against tumour formation.[60] These and other studies indicate that methylation status has some significance in disease susceptibility and resistance. The level of methylation can be influenced by diet and environmental factors such as the presence of toxicants. For example, cancer patients typically show unusual changes in DNA methylation (lower levels) that predispose heritable material to instability and mutations. Air pollution is one factor contributing to these changes.[61]

Expression may also be influenced by ambient environmental conditions. Studies on the incidence of viral disease (gastrointestinal, respiratory, and vector borne) have shown that many of them display a marked seasonality with a peak in winter.[62] Both the pathogen and the host immune system are influenced by cold weather conditions. Exposure to cold or induced hypothermia increases the risk of upper and lower respiratory tract infections. Suppression of the body's immune responses and the reactions of the respiratory tract membranes have been associated with the increased susceptibility. This outcome is due to the restriction of blood supply to the respiratory system surface tissues caused by body surface cooling. This resulted in fewer white cells being available in this area to fight infection. The impact of low temperatures is most acutely felt by the young and the elderly and, not surprisingly, the risk of infection increases with exposure duration.[63]

Coinfection of a host by one pathogen may predispose it to severe infection by another. For example, the presence of active bacterial pathogens may predispose the host to a more severe form of influenza A virus infection.[18]

## Conclusions

The emergence of pathogenic viruses in feeling organisms can be accounted for using the creation of viruses in non-sentient forms of life as the starting point. In these simple forms of life, viruses have been shown to have a number of benign to useful and seemingly indispensable functions along with population controlling roles.

Cells in prokaryote (bacteria) and eukaryote organisms possess genes in structures other than the chromosome. Particularly in bacteria, movement of genetic information between chromosome, plasmids, and phages has been documented. This introduces the possibility for novel combinations of genetic material. The phages in turn may have been responsible for the generation of some dsDNA and dsRNA viruses. Recombination events are possible between RNA and DNA viruses, which raises the possibility that recombination could occur between plasmid DNA and RNA viruses, hence leading to additional viral lines.

Transposable pieces of DNA are commonly found in various cells. They contain proteins similar to those found in some viruses that suggest they could have given rise to the necessary virus capsid proteins. Transposable elements also show a number of sequence similarities to information held by plasmids and phages.

The involvement of retroelements in virus emergence cannot be overestimated, as such elements are abundant in various genomes of higher organisms. These elements are incorporated into the cell DNA after transcription from a RNA molecule. They may also behave as plasmids. Retrotransposons may be released from cells under stress conditions in microvesicles that are classically generated by host cells. Some of the retrotransposons possess the capacity to form envelope-type proteins, which are a suitable starting point for virus protein envelope construction. These observations and others indicate that retroelements

possibly have played a significant role in the generation of retroviruses.

Transfer of information across the species barrier may be facilitated by invertebrates and pathogens, such as fungi. Mixing of genetic information may occur in these environments when viruses are capable of multiplying. Exchange of genetic information may also occur in amoebal-type organisms and human milk, which can contain an admixture of genetic information and microbes.

Genes conceivably can be acquired from the host organism and incorporated into the viral genome permitting new combinations to emerge. Then again it is known that recombination among related viruses can lead to the emergence of new variants. Changes in the status of a virus particle from harmless to disease-causing may be associated also with both host changes and environmental influences.

While there are obvious gaps in our knowledge, the scenarios painted are reasonable from a scientific viewpoint. Those who believe that God created the fundamental life-forms and biological entities have an additional piece of information to add to the puzzle on origins. Fundamental changes in the fidelity of cellular events following the Fall are indicated in Genesis and the account given by patriarch Job indicates the involvement of malevolent intelligent agencies in the generation of pathogens. Direct evidence for this latter proposition cannot be guaranteed, but human endeavours have shown that novel structures, as spoken about in Genesis, can be generated by both conventional and modern genetic manipulation techniques. The account given by Job on the generation of a pathogenic bacterium is not an outlandish proposition for modern genetic engineers. This means that in the end, faith must be placed in the biblical account or the miracles needed[64] to bridge the gap between non-life and the generation of living cells propounded by those who choose not to believe.

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# The mysterious Rising Star fossils

*Peter Line*

Publication of the *Homo naledi* fossil material has generated considerable interest among evolutionists as to where this 'species' fits in their human evolutionary trees, as well as among creationists as to how it fits within the biblical framework of history. How the remains ended up in the inaccessible Dinaledi Chamber is also a topic of debate and interest. Rejecting the evolutionary view of history, this paper analyzes the skeletal features of *Homo naledi* in order to determine its most likely identity. Drawing certain parallels with *Homo floresiensis*, I conclude that *Homo naledi* possibly represents 'robust human' individuals that suffered from a non-genetic developmental pathology such as cretinism.

Publication of the Rising Star fossils (assigned the new species name *Homo naledi*) on 10 September 2015,[1] by a team of paleoanthropologists led by Lee Berger of Wits University, Johannesburg, generated worldwide interest. A companion paper by Dirks *et al*. described the physical context of the Dinaledi Chamber within the Rising Star cave system, Cradle of Humankind, South Africa, where the fossils were found.[2] I published a detailed examination of *Homo naledi* earlier,[3] and this paper revisits and summarizes aspects of that analysis, incorporating developments since then.

*H. naledi* is said to exhibit some anatomical features resembling those present in *Australopithecus*, other features resembling those in *Homo*, as well as several unique features.[4] As yet no stone tools have been associated with the *H. naledi* fossils.[5]

Almost as intriguing as the identity of the strange *H. naledi* fossils is how the remains ended up in the inaccessible Dinaledi Chamber. A deliberate body disposal scenario is considered the most plausible explanation by the authors.[6] Currently there is only evidence of there ever having been one entrance to the chamber, but if future findings reveal other entrances once existed, as suggested by Val,[7] making the chamber more accessible in the past, then that will have a bearing on interpretations of how the bones ended up in the chamber, and perhaps even on the interpretation of the fossils themselves. Already evidence is emerging indicating there likely was an additional entrance to the chamber.[8] This evidence is based on mysterious black spots (manganese dioxide) deposited on the *H. naledi* bones by, most likely, lichen, and as lichen needs light to grow, logically some light must have penetrated the Dinaledi Chamber in the past.[9] Either that, or the light exposed *H. naledi* bones with lichen/manganese dioxide were later placed in the chamber, long after soft tissue decomposition.

Currently no 'age' is associated with the bones, but the Berger team considers *H. naledi* 'primitive' in morphology compared to *Homo erectus*, maintaining that "the *H. naledi* lineage must have existed earlier than the first occurrence of *H. erectus* around 1.8 Ma."[10] To evolutionists the bones "could be more than four million years old or less than 100,000 years old."[11] A phylogenetic study by Dembo *et al.* claims the most likely age for *H. naledi* is 912 ka,[12] but the study depended on unfounded assumptions, including assuming evolutionary relationships between fossil species and accepting dates associated with fossil specimens as valid, as well as biasing the characters used to one anatomical region, the skull (including teeth), making the findings unreliable on this measure alone.[13] An earlier similar type of study estimated *H. naledi* to be about 2 Ma old.[14] That some of the *H. naledi* bones were described, by the recreational cavers who made the discovery, as "just lying about on the surface, as if someone had tossed them in,"[15] may indicate the bones are quite young. Hence, one wonders about the extent of fossilization of the bones, that is, to what extent have organic substances in the bone been replaced with mineral substance. Radiocarbon dating of a small sample of the bones would be very interesting. Of interest also is whether they will be able to extract and sequence DNA from the bones.

The Berger *et al.* analysis is based on multiple individuals, and on the assumption that the fossil "material represents a single species, and not a commingled assemblage."[16] No other large animal remains have been found in the chamber, and apparently the bones indicate no damage caused by scavengers or predators, although suggestions that "post-depositional cortical bone removal by invertebrates may have obliterated evidence for surface modification of bone by carnivores" has had to be defended.[17] Presently the single species assumption is plausible, but it cannot be ruled out that future excavations inside the Dinaledi Chamber will indicate multiple species were present. Apparently the bones recovered so far represent only a small portion of what is in the chamber, so there may be further surprises in store.

In analyzing the *H. naledi* skeleton (figure 1) here the focus will be on features that the Berger team indicate are

outside the range of humans, whether modern or 'robust' (such as *H. erectus*, *Homo heidelbergensis* and Neandertals), in order to determine whether *H. naledi* represent human individuals, australopithecine apes, or perhaps humans with pathology.

## Rib cage and vertebrae

The description of the vertebrae is consistent with *H. naledi* being human.[18] The rib cage of *H. naledi* is described as "wide distally" like *Australopithecus afarensis*, and elsewhere in the paper the thorax is suggested as being "pyramidal in shape".[19] The *H. erectus* Nariokotome boy (KNM-WT 15000) is described as having a barrel-shaped thorax, like us.[20] Interestingly, the Neandertal rib cage is not barrel-shaped, like in modern humans and *H. erectus*, but an assembled entire Neandertal skeleton (consisting of fossil elements from several different sites) "boasted a conical thorax that tapered upward from the broad pelvis to a narrow top, giving it an incredibly distinctive look."[21] Before 2001, however, the Neandertal rib cage had been illustrated in textbooks to look like a "barrel-shaped human model".[22] The reconstructed rib cage of *Australopithecus afarensis* (represented by the famous specimen Lucy AL 288-1) is described as being "shaped like a funnel, with the narrow part at the top and a wide lower region."[20]

Hence, a wide distal (lower region) rib cage can, apart from being interpreted to be like *Australopithecus afarensis*, also be interpreted as being similar to that of the Neandertals. As I (and most creationists) regard Neandertals (and *H. erectus*) as fully human, the rib cage does not preclude *H. naledi* from also being human, even if its lower rib cage is broad, as suggested by the authors, as it would fall within human variation. However, a reconstruction "suggesting that the thorax was pyramidal in shape" sounds unconvincing.[18] Presently the shape of *H. naledi*'s rib cage is probably best described as indeterminate.

## Shoulder

The shoulder of *H. naledi* is stated as being "configured with the scapula situated high and lateral on the thorax, short clavicles, and little or no torsion of the humerus."[18] Humeral torsion is an angle that "refers to the orientation of the humeral head relative to the distal end of the humerus."[23] Low humeral torsion is also present in the *H. erectus* Nariokotome boy[24] and the *H. erectus* Dmanisi humeri.[25] Hence, a low humeral torsion does not preclude *H. naledi* from being human. At the 2016 meeting of the American Association of Physical Anthropologists (AAPA) it was reported that the humeral torsion of *H. naledi* was well below the range of both fossil and extant taxa.[26] If true, this is more akin to the low initial estimate of humeral torsion (110°) in the *Homo floresiensis* LB1 specimen (figure 2), possibly indicating pathological developmental influences on torsion, but it could also be inconsequential as the revised LB1 torsion (115° or 120°), although still very low, is reportedly within the range of "extant small-bodied humans".[27]

**Figure 1.** *Homo naledi* skeletal material, including composite skeleton in the centre representing multiple individuals (cc Lee Roger Berger research team).

Concerning the short clavicle of *H. naledi*, a relatively short clavicle has also been reported for the *H. erectus* Nariokotome boy,[28] and so a short clavicle is not inconsistent with *H. naledi* being human. As for the suggestion that the scapula is situated high on the thorax in *H. naledi*, this is also a possible interpretation of the Nariokotome boy specimen,[29] and therefore does not rule out *H. naledi* being human.

Scapulae from australopithecines such as *Australopithecus afarensis* specimen AL 288-1 and *Australopithecus africanus* specimen Sts 7, as well as the great apes, differ from that of

modern human scapulae in having a more cranially oriented glenoid fossa (cavity), indicating habitual use of the arm in an elevated position "that would be common during climbing behavior",[30] such as suspensory arm-swinging.[31] Studies of the more complete right scapula of the Nariokotome boy indicate that the glenoid fossa in *H. erectus* was not cranially oriented; although a Dmanisi *H. erectus* scapular fragment was more cranially oriented than that of the Nariokotome boy, it was still within the human range.[32]

The orientation of the glenoid fossa in *H. naledi* is stated to be "markedly cranially-oriented".[33] John Hawks, a senior researcher in the Berger group, comments that the "*H. naledi* scapula has a superiorly oriented glenoid, very different from the Dmanisi scapula specimen or the Nariokotome *H. erectus* skeleton."[34] At the AAPA 2016 meeting it was reported that the glenoid fossa of *H. naledi* was as cranially oriented as gibbons (hylobates).[26] The orientation of the glenoid fossa is more cranial in gibbons than in the great apes (chimpanzees, orangutans, and gorillas), modern humans (*Homo sapiens*),[35] and australopithecines such as *Australopithecus afarensis* specimen AL 288-1 and *Australopithecus africanus* specimen Sts 7.[36] Hence, how could *H. naledi* be a transitional form between the australopithecines and a later species of *Homo* if its shoulder (in regards to glenoid fossa orientation) is even more ape-like than its hypothetical australopithecine ancestor.

**Figure 2.** A replica skeleton of the *Homo floresiensis* LB1 specimen displayed at the Smithsonian National Museum of Natural History, Washington, DC

## Hand

In the initial paper by Berger *et al.* it is stated that the hand of *H. naledi* "shares many derived features of modern humans and Neandertals in the thumb, wrist, and palm, but has relatively long and markedly curved fingers."[18] A later publication on the hand of *H. naledi* by Kivell *et al.* essentially told the same story as the initial paper, stating:

> "… the wrist and palm are generally most similar to those of Neandertals and modern humans, while the fingers are more curved than some australopiths. This distinctive mosaic of morphology has yet to be observed in any other hominin taxon and suggests the use of the hand for arboreal locomotion in combination with forceful precision manipulation typically used during tool-related behaviours."[37]

There appears to be something very strange about the curvature of *H. naledi*'s fingers, and that is the high degree of curvature of not just the proximal phalanges (PPs), but also the intermediate phalanges (IPs). At face value the fingers of *H. naledi* appear better suited to climbing than chimpanzees, as the PPs are about the same curvature, but *H. naledi*'s IPs are considerably more curved than chimpanzees and australopithecines, the median value even higher than orangutans.[38] According to the authors "extant apes and most fossil hominins,

such as A. afarensis and OH7, generally have more strongly curved PPs and comparatively straight IPs."[39] Yet, other aspects of *H. naledi*'s hand, such as the "thumb, wrist, and palm bones all look remarkably modern."[40] Hence, most of the of *H. naledi* hand is human-like, except for the markedly curved fingers, stated as "a clear functional indication that its fingers experienced high loads during grasping required for climbing or suspensory locomotion."[39]

It should be noted that "degree of longitudinal curvature is strongly correlated with the degree of arboreal locomotion across primates, with climbing and, especially, suspensory taxa showing much stronger curvature than terrestrial quadrupedal or bipedal taxa."[41] Also, changes in phalangeal curvature appears to be associated with functionality (i.e. locomotion) during ontogeny, "such that more arboreal juveniles have more strongly curved phalanges than their more terrestrial adult counterparts."[41] A study on the biomechanics of phalangeal curvature concluded that "the strain differences between curved and straight phalanges illustrated here support the common assertion that phalangeal shaft curvature is related to the strains associated with arboreal and especially suspensory activity."[42]

*H. naledi*'s hand does not make sense in an evolutionary scenario because, if *H. naledi* is transitional between the australopithecines and a later species of *Homo*, then functionally (as indicated by finger curvature) it appears that *H. naledi* was even better suited to an arboreal lifestyle than its hypothetical australopithecine ancestor, when it should be less so. As with glenoid fossa orientation of the shoulder, it is very unlikely that the high degree of phalangeal curvature exhibited by *H. naledi* can be explained by normal human variation, if indeed the hand is from a human.

It is interesting that in regards to *H. floresiensis* "the proximal phalanges are curved to a similar degree as in *Au. afarensis*".[41] The proximal phalanx referred to belongs to the LB6 *H. floresiensis* individual. The authors of the publication that performed the study commented that "LB6/8 falls at the extreme upper end of the human range and overlaps with gorillas. It is similar in this respect to A.L. 333w-4, an *Australopithecus afarensis* specimen."[43] The proximal manual phalanges of the *H. floresiensis* LB1 individual were not complete enough to make conclusive judgment on curvature.[44] No information appears to be given on the curvature of the intermediate manual phalanges of the LB1 and LB6 *H. floresiensis* individuals.[45]

The species designation of *H. floresiensis* has been controversial, as it has been argued by some evolutionists that it instead consists of individuals, such as LB1 and LB6, that "are, most likely, endemic cretins from a population of unaffected *H. sapiens*."[46] Hence, did the *H. naledi* individuals suffer from cretinism, in a similar way that individuals from the *H. floresiensis* species possibly did, with the curved fingers related to cretinism or associated conditions?

## Pelvis

According to the Berger group the pelvis of *H. naledi* "appears to be flared markedly like that of *Au. afarensis*."[47] There are pelvic bones attributed to *H. erectus* that are described as having "broad, laterally flaring ilia", including the Gona specimen (BSN49/P27), OH 28 and KNM-ER 3228.[48] According to Gruss the "pelvis of *H. erectus*, while broad compared with modern humans, was narrower relative to body height than in the australopithecines."[49] As opposed to being markedly laterally flared, in modern humans the iliac blades curve or wrap around the sides of the body considerably more. The australopithecine ilium has been described as "excessively broad", such that the "breadth of the human iliac blade is actually intermediate between those of the chimp and of *Australopithecus*."[50]A later presentation of the pelvic features reported that the angle of lateral iliac flare on the best preserved pelvic fossil (U.W. 101-1100) in the *H. naledi* sample was:

> "… identical to that seen in *Australopithecus* fossils like Lucy and Sts 14. It is such a wide angle that there is no way to reconstruct the *Homo naledi* hip to make it look not-flared. This extreme amount of flare is a primitive hominin feature that is not found in other *Homo* pelvic remains, even though fossil *Homo* pelves have been described as being more flared than modern humans."[51]

The authors note that it is possible the Gona pelvis also has similar extreme amount of flare, as that of the *H. naledi* pelvis, but that it may not matter as there is debate about whether the pelvis is a species of *Australopithecus* rather than *H. erectus*.[51] Hawks states that "the pelvis of *H. naledi* exhibits a short, flared ilium unlike those known for *H. erectus*, including the Gona pelvic specimen."[52] Hence, it appears the extreme lateral iliac flaring observed in the *H. naledi* pelvis is outside the range of *H. erectus*.

Similar to the description of the *H. naledi* pelvis, it has been stated in regards to the pelvis of the *H. floresiensis* type specimen (LB1) that its "marked degree of lateral iliac flaring recalls that seen in australopithecines such as 'Lucy' (AL 288-1)."[53] As already mentioned, some evolutionists believe individuals from *H. floresiensis* were actually pathological humans, with cretinism a plausible explanation.[46] Interestingly, one of the features noted in cretinism is lateral flaring of the ilium of the pelvis.[54]

## Foot

Assessing *H. naledi* the Berger group state that "the foot and ankle are particularly human in their configuration".[47] Essentially the only traits of its foot regarded as "primitive" are evidence "suggestive of a lower arched foot"[18] and "slightly more curved toe bones".[55] Paleontologist Will Harcourt-Smith, lead author on a subsequent publication

on the *H. naledi* foot,[56] that essentially told the same story as the initial paper, states it "is essentially the foot of a modern human, but subtly different."[55] Paleoanthropologist Dan Lieberman is quoted as saying: "The foot is indeed strikingly modern … and suggests it walked and *possibly* ran much like modern humans."[57]

According to evolutionary experts: "All primates possess a transverse arch, but only humans have a longitudinal arch making non-human primates anatomically and functionally flat-footed."[58] The longitudinal arch is a structure involved in storing elastic energy and it "maintains the structural rigor of the foot during the push-off stage of bipedal locomotion."[58] As for the lower arched foot, the Berger group state in their separate Fact Sheet that *H. naledi* "likely had minimally developed longitudinal foot arches (i.e. flatter feet), which is uncommon (but not unknown) in living people."[59] Flatfoot is a frequently encountered pathology in both pediatric[60] and adult[61] human populations, and is not regarded as a 'primitive' condition of modern humans, and neither should it be in the foot of *H. naledi*, particularly as the "relatively low medial longitudinal arch" interpretation appears to be based on one foot (Foot 1).[62] It is interesting to note that, according to Jungers *et al*., in *H. floresiensis* the big toe (hallux) was fully adducted (in line with the rest of the foot), but a medial longitudinal arch was suspected to be absent.[53] Hence, *H. floresiensis* probably had flatter feet than *H. naledi*.

The Fact Sheet mentions human-like features of *H. naledi*, for example, that their "big toes were in-line with the rest of the foot, unlike the grasping, opposable big toe in chimps", but also mentions that their "toes were also slightly curved—not as much as a chimp's toes—but more than in humans".[59] The range of curvature in the pedal proximal phalanges of *H. naledi* appear to overlap considerably with *H. sapiens*, so this finding is probably not that significant,[63] although it is a little bit odd in that it does not appear to reflect any functionality. To be used effectively for climbing in trees the feet of *H. naledi* would need to have a grasping, opposable big toe as chimpanzees do, but *H. naledi*'s big toe was in line with the rest of the foot, like in humans. It is interesting that the toe bones of *H. floresiensis* are also said to be slightly curved (i.e. the proximal pedal phalanges).[53] As already mentioned, *H. floresiensis* is possibly associated with cretinism.

## Other postcranial skeletal parts

Based on a tibia (U.W. 101-484), the stature of one *H. naledi* individual was estimated to be just under 1.5 m, whereas body mass was estimated, from eight femur specimens, to vary from about 40 kg to 56 kg; with estimates of both stature and body mass "similar to small-bodied modern human populations".[64] It is stated that locomotor "traits shared with Homo include the absolutely long lower limb",[65] which is consistent with *H. naledi* being human-like. *H. naledi* is said to possess a valgus knee[66] (angling inward of the femur making the knees closer together), a characteristic of humans that allows efficient bipedalism.

Much fuss has been made about *H. naledi*'s femoral neck being relatively long and anteroposteriorly compressed,[67] a feature allegedly making it look different from African and Dmanisi femora attributed to *H. erectus*.[52] It is generally considered an "archaic morphology"[68] (i.e. femoral necks that are narrow anteroposteriorly relative to superoinferiorly), as it is considered typical of the australopithecines, but not in modern humans or femora attributed to *H. erectus*.[69] Whilst as a group the femoral neck of australopithecines are statistically anteroposteriorly compressed compared to modern humans, data from Ruff and Higgins indicated that individually quite a few of the femora from the modern human sample were similarly anteroposteriorly compressed.[70] Hence, as this feature is not unique to the australopithecines, but also present in modern humans, albeit less frequently, it is not an "archaic morphology" that supports assignment of *H. naledi* to a new species of 'ape-man'. Ruff and Higgins had two femora (KNM-ER 1472 and KNM-ER 1481) attributed to *H. erectus* as part of their analysis.[71] These were not anteroposteriorly compressed, and even if the Dmanisi femur is not either, then this only leaves a sample size of three—hardly enough to establish the range of intra-species variation.

## Skull

According to the authors the "morphology of the cranium, mandible, and dentition is mostly consistent with the genus *Homo*, but the brain size of *H. naledi* is within the range of *Australopithecus*."[47] The authors compared the *H. naledi* skull (figure 3) with those of other fossil species and found none that *H. naledi* could be incorporated into. When the *H. erectus* Dmanisi Skull 5 was revealed in 2013,[72] one of the big surprises was the implication of this find on the variability of *H. erectus*, at least of the skull, with the morphological variation considerable indeed.[73] Given the enormous variation in the skulls of specimens labelled *H. erectus*, is the skull of *H. naledi* really that different? According to Tim White the *H. naledi* fossils "are a small, primitive *H. erectus*".[74] John Hawks responded to White's assessment by saying "*H. naledi* does not have the elongated, low cranium of *H. erectus*".[34]

In Chris Stringer's accompanying *eLife* article *H. naledi* is labelled as having a "relatively high and thin skull" and small teeth, whereas *H. erectus* is labelled as having a "relatively low and thick skull" and large teeth, with both having a flexed occipital and transverse torus.[75] The Berger paper states that "compared to samples of *H. habilis*,

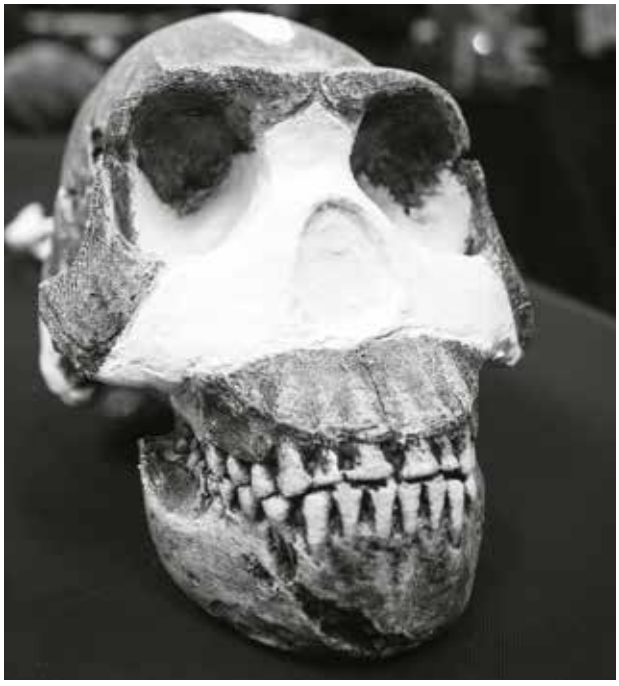

**Figure 3.** Replica of the composite *Homo naledi* skull. The white areas represent missing bone (cc Wits University).

*H. rudolfensis*, and *H. erectus*, the teeth of *H. naledi* are comparatively quite small, similar in dimensions to much later samples of Homo."[76] Having small teeth is a feature of modern humans, as is having a high and thin skull. Also, the cranial vault of *H. naledi* is described as having only slight post-orbital constriction, the mandibular dental arcade as parabolic in shape, and the mandibular corpus (body) as being relatively gracile.[77] These features of the skull do not align it with the australopithecines, but rather with humans, although the skull of *H. naledi* is not that of an anatomically modern human. In *National Geographic* the general shape of the composite male *H. naledi* skull is said to be "advanced", as well as labelled a "Humanesque skull".[78]

There is indisputable evidence that the morphology of skulls classified by evolutionists as *H. erectus* vary considerably, a point illustrated by Schwartz *et al*.[79] Regardless of whether it is classified as *H. erectus* or not, the form of the *H. naledi* skull appears to be within human variation (here human variation encompasses the combined range of both modern and robust humans).

## Cranial capacity

Perhaps the most astonishing aspect about *H. naledi* is its small cranial capacity.[80] *H. naledi* is said to be "characterized by body mass and stature similar to small-bodied human populations but a small endocranial volume similar to australopiths."[81] Details of the virtual reconstruction of the composite crania is given in the Berger group paper,[82] and apart from merging crania from different specimens, a problem with the cranial capacity values of *H. naledi* appears to be the amount of guesswork involved, evident by reference to the number of holes (large and small) filled by various software functions. Large parts of both composite skulls are missing including, for example, most of the cranial base in the smaller DH3/DH4 composite cranium (465 cc), and most of the frontal region in the larger DH1/DH2 composite cranium (560 cc). Whilst the cranial capacity of *H. naledi* is undoubtedly small, there could large errors in estimation.

Before *H. naledi*, the smallest estimate of cranial capacity of a *H. erectus* skull from Africa, at 691 cc, was KNM-ER 42700, believed to be of "a young adult or a late subadult".[83] Outside Africa, smaller *H. erectus* cranial capacities have been estimated from Dmanisi, Georgia. The cranial capacity of 546 cc for the adult Dmanisi Skull 5 (D4500/D2600) is the smallest of the Dmanisi sample, with cranial capacities of the other four skulls reported to be between 601 cc to 730 cc.[84] Of other interest is the LB1 *H. floresiensis* cranium, most recently estimated to be 426 cc.[85] The mean cranial capacity for modern humans is about 1345 cc, but the range of modern humans able to function normally is difficult to specify, although approximately 700 cc to 2,200 cc is given by expert Stephen Molnar, who comments that "there are many persons with 700 to 800 cubic centimeters".[86] One of the smallest brain sizes documented of a modern human with normal intelligence was from Daniel Lyon, a man of small stature (height of 1.55 m), with a brain volume of about 624 cc,[87] and hence an estimated cranial capacity of 660 cc.[88]

## Discussion and conclusion

Can *H. naledi* be human? Most of the features that are said to be 'primitive' in *H. naledi* are still within human variation, whether it be modern humans or robust humans. One explanation why robust humans, such as *H. erectus*, *H. heidelbergensis* and Neandertals, were more robust (heavily built) and/or different in morphology to modern humans is that it could reflect differences in development of these pre-Flood and early post-Flood humans, linked to longevity.[89]

From a creationist point of view, if *H. naledi* is human the features most difficult to explain are those that appear outside normal human variation, whether modern or robust humans, in particular the small cranial capacity, the extreme lateral iliac flaring observed in the pelvis, the strongly curved fingers of the hand, and a glenoid fossa said to be markedly cranially oriented, like a gibbon. Such extreme skeletal features make it hard to argue *H. naledi* individuals were normal (non-pathological) humans, although some

suggest just that,[90–92] with Kurt Wise stating the "mosaic nature of characters exhibited by the *naledi* are consistent with fossil human morphologies being non-adaptive morphologies expressed from latent genetic material and fixed by genetic drift in small populations dispersing from Babel."[93] This model proposes there was a period of rapid human diversification beginning during the construction of Babel, resulting in extreme morphological variability in post-Babel humans repopulating the earth.[94] Other explanations are that *H. naledi* were strange extinct apes,[95] a mixture of both human and extinct ape bones,[96] or robust humans with pathology,[3] the case for the latter restated in this paper.

In paleoanthropologist Tim White's eye, "Berger's findings are probably South African representatives of *H. erectus.* The *H. naledi* cranium is similar in conformation and size to the earliest and most primitive *H. erectus* representatives."[97] Hence, as discussed earlier, and also in the opinion of other evolutionary experts, the cranium of *H. naledi* is likely within the *H. erectus* range of variability. An unusual aspect of the cranium, however, is its diminutive cranial capacity, which is small even for *H. erectus*. Although there are doubts about the accuracy of the estimated cranial capacity values of the *H. naledi* composite skulls (465 cc and 560 cc), they are undoubtedly very small, and outside the range of what could be considered normal for modern humans.

If *H. naledi* are just small-brained *H. erectus* specimens, are they part of the normal variation of these robust humans? Given the number of *H. erectus* specimens with small cranial capacities, it is hard to escape the conclusion that the range of what could be considered normal brain size was lower in *H. erectus* compared to modern humans. Even so, the only skulls comparable to *H. naledi* in terms of cranial capacity are 546 cc for the Skull 5 Dmanisi *H. erectus* cranium and 426 cc for the LB1 *H. floresiensis* cranium, I consider both to be robust humans that had suffered from some sort of developmental disorder, possibly cretinism.[73]

In regards to *H. floresiensis*, some evolutionists have argued that it shows similarities to hypothyroid endemic cretins "from a population of unaffected *Homo sapiens*".[46] Cretinism brought about by environmental iodine deficiency (cretins being the offspring of mothers with severe iodine deficiency) is not a genetic disorder,[98] and can occur anywhere in the world there is iodine deficiency in the food chain. As such it can affect entire populations in an environment where iodine deficiency is endemic, and people in different parts of the world, although "morphological traits vary substantially".[99] Cretinism (congenital hypothyroidism) "can reduce brain size by approximately 50%".[100] Hence, whilst cretins from modern human populations of large brain size may not give rise to cretins with small enough brains to explain *H. naledi* or *H. floresiensis*, parent populations with smaller brains, such as *H. erectus* humans, could do so. Most likely so would also the small-brained *H. sapiens* population from Palau, Micronesia,[101] but if individuals assigned to *H. naledi* and *H. floresiensis* are cretins then it makes more sense that they come from robust human populations, such as *H. erectus*, because of their similarity in skeletal features to the latter. In regards to *H. floresiensis*, in the original publication announcing the find it was suggested that it was the result of "endemic dwarfing, of an ancestral *H. erectus* population".[102]

Apart from small brain size and stature, some of the alleged 'primitive' skeletal features reported in *H. naledi*, that have been discussed earlier, which are also noted in *H. floresiensis*, are: lateral flaring of the ilium of the pelvis,[53] relatively short clavicle,[103] low humeral torsion,[103] reduced medial longitudinal arch (i.e. flatter feet; actually arch suspected to be absent in *H. floresiensis*),[53] curved finger bones,[43] and slightly curved toe bones.[53] Some of these features have also been documented in modern humans with cretinism, including lateral flaring of the ilium of the pelvis,[54] relatively short clavicle,[104] and low humeral torsion,[105] whereas the presence of other features is unclear.

If individuals of *H. floresiensis* and *H. naledi* suffered from cretinism one would not expect them to show exactly the same features, particularly ones living as far apart as Africa and Indonesia. This is because "cretins are enormously more variable than unaffected humans in many features (as would be expected in a pathology with different degrees of affect [sic], and conflation with associated conditions)".[106] According to Charles Oxnard "all cretins are not identical. The effects of the deficiency vary to greater or lesser degree. Their genetic heritages can also be expected to influence the picture."[107] Evolutionist Oxnard makes the following revealing statement:

> "It is remarkable that so many features similar to those normally present in great apes, in *Australopithecus* and *Paranthropu*s, and in early *Homo* (e.g. *H. erectus* and even to some degree, *H. neanderthalensis*) but not in modern *H. sapiens* are generated in humans by growth deficits due to the absence of thyroid hormone. In other words, many of the pathological features of cretinism mimic the primitive characters of evolution making it easy to mistake pathological features for primitive characters."[108]

If a modern human with cretinism can have many pathological features that mimic the so-called 'primitive' features of evolution, it is highly likely that robust humans, such as *H. erectus*, with cretinism will have as many, if not even more such features, yielding individuals that look like members of *H. floresiensis* and *H. naledi*.

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# Where was Eden? part 1—examining pre-Flood geographical details in the biblical record

*Lita Cosner and Robert Carter*

The Bible includes only sparse geographic data in its descriptions of the pre-Flood world. This has led to widely divergent theories on the relationship between antediluvian and postdiluvian topography. The majority of place names that are repeated on both sides of the Flood are simple generic words describing common features of the pre- and post-Flood world. No modern candidate for the location of Eden fulfils the clear biblical conditions for the location such as one river splitting into four. This is because Eden is not placed in reference to modern geographical landmarks, but to pre-Flood topography. The goal of this study is to provide a thorough analysis and refutation of popular modern locations for Eden in order to better establish the idea that Eden was utterly destroyed by the Flood and that attempts to place Eden in a modern geographical context are misguided.

The geography of Genesis 2 is difficult to interpret. As far back as Josephus we find attempts to locate the setting of the Garden in Eden.[1] Augustine affirmed that Eden was an actual place, though he allowed for allegorical meanings.[2] He also tried to explain the four rivers of Eden by positing that some might have flowed underground.[3] Martin Luther believed that the global Flood changed the appearance and perhaps the sources of the rivers and greatly changed the face of the earth, but he located Eden in Mesopotamia anyway.[4] John Calvin believed that the modern Tigris and Euphrates were the Hiddekel and P'rath of Genesis 2. He imagined a place where the two formerly joined to each other was the 'one river', and where they split upstream and downstream were the 'four headwaters' (figure 1). He expressly rejected the idea that the Flood changed the landscape:

> "… still, I assert, it was the same earth which had been created in the beginning. Add to this, that Moses (in my judgment) accommodated his topography to the capacity of his age."[5]

Examples of this sort of interpretation could be multiplied, but the above is sufficient to establish that scholars have been putting forward problematic and mutually inconsistent explanations for the location of Eden for millennia.

However, the view that Eden and the rivers of Genesis 2 are located in Mesopotamia accidentally opened the door for long-age interpretations because it minimized the geological effects of the Flood. Modern biblical creationists attribute the geological record to the global Flood, and so generally accept that the geography described in Genesis 2 would have been destroyed. They explain the reoccurrence of certain post-Flood place names as re-naming after pre-Flood landmarks.[6,7] However, this study will show that, while on the right track, this explanation is incomplete and fails to account for all the data.

James R. Hughes has written perhaps the most comprehensive study on the geography of Eden in his 1997 paper for the CRSQ,[8] which was a response to a *Westminster Theological Journal* article attacking biblical creationist interpretations of Eden's geography.[9] However, it seems useful to publish a survey in this journal with a slightly different emphasis, while giving due credit to those who have preceded us.

The goal of this study is to bring clarity to the text while refuting attempts to locate Eden in the post-Flood world. We intend to show: 1) The geographical landmarks in Genesis 1–11 are intended to be read as real-world places; 2) This geography does not exist anywhere on the present-day earth; and 3) The explanation for similar place names in the post-Flood landscape in most cases is more complex than re-naming after antediluvian landmarks.

## Biblical evidence of pre-Flood geography

Most of the geographical data from the pre-Flood world comes from the Genesis 2 creation narrative:

> "And the LORD God planted a garden in Eden, in the east, and there he put the man whom he had formed … . A river flowed out of Eden to water the garden, and there it divided and became four rivers. The name of the first is the Pishon. It is the one that flowed around the whole land of Havilah, where there is gold. And the gold of that land is good; bdellium and onyx stone are there. The name of the second river is the Gihon. It is the one that flowed around the whole land of Cush. And the name of the third river is the Tigris, which flows east of Assyria. And the fourth river is the Euphrates


**Figure 1.** A map from Calvin's Genesis commentary (Calvin[5])

(Genesis 2:8, 10–14)."

It is worth noting that the garden is *in* Eden (Genesis 2:8), so Eden was a larger area than the spot occupied by the garden. "In the east" probably indicates that the garden was in the eastern part of the region. The name 'Eden' may be related to a Hebrew word meaning luxury or delight.[10]

The rivers are a key identifying feature of the geography surrounding Eden. As Currid states:

> "After feeding the garden, the river leaves it and then divides into four 'headstreams'. That term in Hebrew is related to the first word in the Bible, 'beginning'; thus, when the river separates it breaks up into four 'beginning streams' or 'headwaters'. These headwaters are the sources of four great rivers, and these will be identified in the next verses."[11]

The feature of one river splitting into four rivers would require interesting topography seen nowhere in the modern, post-Flood world (see part 2 of this paper[12]).

## The Pishon river and the land of Havilah

The Pishon flowed "around the whole land of Havilah, where there is gold". Havilah must have been adjacent to Eden, or nearly so, and the course of the river must have twisted so that it could be said to water or flow around the whole land. The name of the river does not occur again in Scripture. Hughes comments:

> "When one reads the account in Genesis 2:8–14, he gets the impression that the Pishon was a significant river equal in importance to the other rivers mentioned. It seems to be incredible that a major river such as the Pishon could disappear from the historic and geographic records so that it left effectively no historic trace of its location. Much of the geography of Moses' day is still identifiable. If the Pishon was a major river in Moses' day, then we would expect to find other historical references to it, or at least be able to identify its location more easily. The fact that Munday has to appeal to a dry wadi as a potential location for the Pishon, seems to indicate that the Pishon did not exist after the Flood."[8]

There are places called 'Havilah' both before and after the Flood, as well as two descendants of Noah (the second son of Cush and the twelfth son of Joktan; Genesis 10:7, 29) with that name. Etymologically the word means 'land of sand' or 'sandy'.[8] The post-Flood area by that name was probably named after the Semitic/Joktanite Havilah, and it was part of the area where the Ishmaelites (also Semites) settled (Genesis 25:18). Amalekites (another Semitic tribe) lived there until Saul defeated them (1 Samuel 15:7).

**Table 1.** Geographic and name references in the pre-Flood world. Words in bold appear both before and after the Flood.

| Proper Names | Place Names | Rivers | Natural Resources | Cardinal Directions |
|---|---|---|---|---|
| Adam, Eve<br>Cain's line: Cain, Enoch (1), Irad, Mehujael, Methushael, Lamech (1), Adah, Zillah, Jabal, Jubal, Tubal-cain, Naamah<br>Abel's line: Abel, Seth, Enosh, Kenan, Mahalalel, Jared, Enoch (2), Methuselah, Lamech (2), Noah, Shem, Ham, Japheth | ***Eden***<br>The Garden<br>*Havilah*<br>*Cush*<br>*Assyria*<br>Enoch (1)<br>Nod | The garden river<br>Pishon<br>Gihon<br>*Hiddekel*/Tigris<br>*P'rath*/Euphrates | *Gold*<br>*Bdellium*<br>*Onyx*<br>*Iron*<br>*Copper*<br>*Tin* (Cu+Sn=bronze)<br>*Wood*<br>*Pitch* | East |

### The Gihon river and the land of Cush

The Gihon river flowed "around the whole land of Cush". Elsewhere in Scripture, there is a Gihon spring which supplied Jerusalem with water (2 Chronicles 32:30; 1 Kings 1:38, 45). The word means 'to bubble'[8] or 'to burst forth' and is thus a generic name. The location of the river associated with the Garden in Eden, however, is a mystery. As Hughes notes:

> "The location of the Gihon cannot be identified in contemporary geographic terms, and appears rarely in the historical records. As with the Pishon it is hard to believe that the location of a second major river in Moses' day would no longer be identifiable."[8]

Because the Gihon is connected to Cush, some Medieval commentators tried to place Eden in Africa, with the Nile as the Gihon.[13] However, this does not allow for the four rivers to split off from one river; there is no way the Nile can be connected to the Tigris and Euphrates. As Hughes said:

> "The fact that Cush in the remainder of the OT is not used to refer to a southern Mesopotamian location, and instead is found in a very distant geographic location ... supports the view that the author is describing a pre-Flood geography, not a post-Flood geography."[8]

Elsewhere in Scripture, Cush is consistently associated with an area south of Egypt, not an area in Mesopotamia. But there is another candidate for this identification:

> "Because Nuzi tablets contain the word *Kussu* for the Kassite people who inhabited the plains and hills east of Babylonia during the second millennium BC, Speiser identified the Cush of Genesis 2 as Kassite country."[9]

Since it is named after a son of Ham, the African Cush is a post-Flood location. But the Kassites were also a post-Flood people. Either way, 'Cush' in Genesis 2 is almost certainly not one of these geographic locations. Also, the Kassites lived in southern Mesopotamia, and there is no candidate for the Gihon river in this area (see figure 2).

### The Hiddekel river and the land of Asshur

The third river is the Hiddekel, which means 'arrow', 'dart', or 'swiftness'.[8] In Genesis 2, the Hiddekel is simply said to flow "east of Asshur". The only other place it is mentioned in Scripture is in Daniel 10:4 where it is applied to the modern Tigris river.

The Hiddekel is said to flow "east of Asshur", but to which 'Asshur' is this referring? The antediluvian region named Asshur (note that all the other localities in this passage are regions) or the post-Flood city that was named after Asshur, the second son of Shem (Genesis 10:22)? Also, the Tigris runs through the *centre* of the ancient kingdom of Assyria, so this is no help.

### The P'rath river

The fourth river, P'rath, is named with no other geographical data. Elsewhere in Scripture, P'rath refers to the Euphrates, and it is significant because it forms the eastern border of the land promised to Abraham's descendants as well as a major geographical landmark (Genesis 15:18; 31:21; 36:37; Exodus 23:31; Deuteronomy 1:7; 11:24; and many more outside the Pentateuch). If the P'rath of Genesis 2 really were the modern river, it's surprising that it is dismissed so quickly with no other descriptors. Some might argue that the sheer familiarity of this major regional river meant that no other description was necessary, but this assumes the river is the same one mentioned in Genesis 2.

### Other geographic references

There are only a few other verses that give references to geography or place names before the Flood:

> "He [God] drove out the man, and at the east of the garden of Eden he placed the cherubim and a flaming sword that turned every way to guard the way to the tree of life" (Genesis 3:24).

Because the cherubim were placed to the east of the garden, one might assume there was only one possible entrance to the garden, and that it was at the east. One might also assume that Adam and Eve would have gone to the east of Eden. While it is always precarious to assume what the text does not explicitly state, their son certainly went east:

> "Then Cain went away from the presence of the LORD and settled in the land of Nod, east of Eden. Cain knew his wife, and she conceived and bore Enoch. When he built a city, he called the name of the city after the name of his son, Enoch" (Genesis 4:16–17).

This passage also establishes that pre-Flood places were named after both significant historical events ('Nod' means wandering, a reference to God's curse of Cain) and people (Enoch, Cain's son).[14]

The place names in Genesis 2 are generic words that deal mostly with easy-to-understand traits. These words are also easily reused, and we suggest they were, explaining how multiple people and places could have the same names. There is a strong tendency to repeat this pattern in modern societies. How many places exist that are named after simple and common terms? And how many places in the New World are named after places from England, France, Germany, or Spain?

The point is that the post-Flood people would naturally have recycled some names, named people after pre-Flood people (who then had post-Flood places named after them), or simply used names that were common before and after the Flood. They would have been as freely inventive as people are today. Thus, we would *expect* a few words to be

found on both sides of the Flood, but the appearance of such words is no more proof that Eden was located in these areas than that the Eiffel Tower is actually located in Paris, Texas.

## Directionality

There is but one cardinal direction referenced in Genesis 2–4: east. The garden was in the east of Eden, the cherubim were placed to the east of the garden, and Cain settled to the east of that. This has caused many to look at 'east' in a metaphorical sense, as if 'east' was the direction of heaven or paradise. As Wenham's Genesis commentary puts it:

> "For in the East the sun rises, and light is a favorite biblical metaphor for divine revelation (Isa 2:2–4; Ps 36:10). So it seems likely that this description of 'the garden in Eden in the east' is symbolic of a place where God dwells."[15]

But if Adam and Eve were removed from the garden toward the east, Eden would have been to their *west*, and east would then be associated with bad things. Significantly, when Israel and Judah went into exile, they also travelled east, and when the Israelites initially entered the Promised Land, they were travelling west.

## Natural resources

The natural resources named in Genesis 2 must be found in any area put forward as a location for Eden (table 1). These are fairly common materials that can be found in scattered pockets across the globe. Bdellium refers either to a type of gemstone or to a plant resin of the kind found only in arid regions today. Onyx is a common mineral found across the world, but is noticeably lacking in the Middle East, as is tin. While it may seem natural to associate 'pitch' with the oil-rich Middle East, in fact, pitch historically has been derived from pine trees.[16]

## Difficulties in finding Eden

Even *if* the pre-Flood Eden were findable, placing it in the Middle East would mean that Noah landed close to his starting point. If we reject the 'local flood' hypothesis, and if we assume the majority of the sedimentary rocks in the region are from the Flood, and if we believe the Ark floated for five *months*, why would we ever think Eden was located in Mesopotamia? The few correlations in place names are easily discounted and the majority of place names in Genesis 2 have no geographic attestation in the region. In fact, the only way to conclude Eden must be a Mesopotamian locale is to first adopt a low view of Scripture!

## Difficulties in finding the four rivers

If one assumes the rivers of Eden can be located on modern maps, one has to start with the Tigris and Euphrates. This generally leads to one of two conclusions: Eden was in Armenia (close to the sources of the Tigris and Euphrates) or Lower Mesopotamia (close to where the two rivers come together). Beitzel in his influential Bible atlas proposes both as possibilities (figure 2).[17] There are two chief problems with the Armenian interpretation: 1) While the Tigris and Euphrates have sources that are very close to each other, they do not come from the same source, much less split off from the same river; and 2) there is no trace of any candidate for Pishon and Gihon in the near vicinity. There are also two main difficulties with the Southern Mesopotamian location: the rivers are flowing the wrong direction (coming together, not separating). Not only that, but Pliny claimed the two rivers emptied into a common lake during the time of Alexander,[18] and they may have had separate mouths earlier in the historical period.

Some suggest that the Persian Gulf could fit the description of Pishon. However, even Munday in his attempt to refute biblical creationists recognizes this view "requires a Hebrew disregard for any distinction between a sea and a river. Such a view has no biblical precedent, and appears impossible given the Genesis 2:10–14 enumeration of *four*

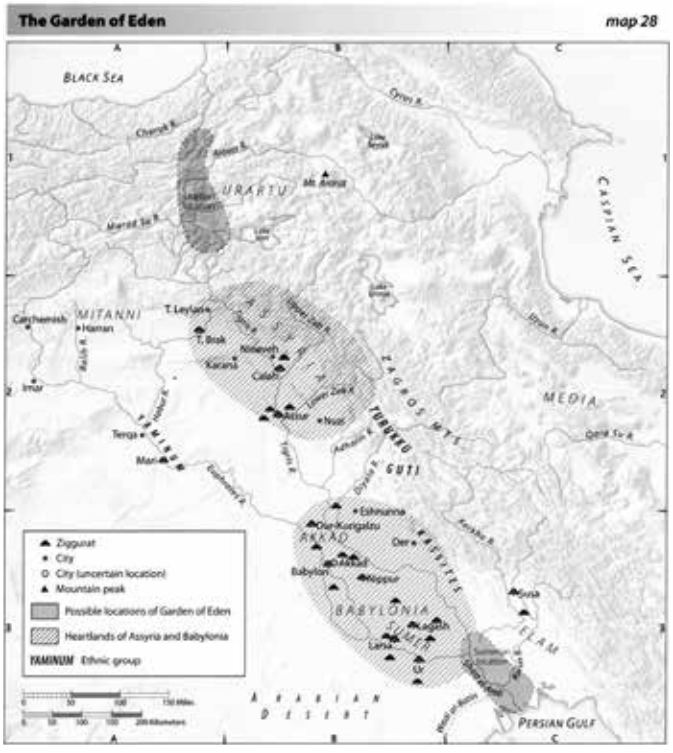


**Figure 2.** A modern Bible atlas's designations for the location of Eden (from Beitzel[17])

**Figure 3.** 'The Garden of Eden' by Thomas Cole (1801–1848)

*rivers*, two of which are obviously *not* seas."[9] Hill argues that the Pishon is a river in Saudi Arabia that existed in Moses' day, but which has since dried up:

> "But where is the Pishon river within the land of Havilah? There is no river flowing from the western mountains of Saudi Arabia down to the head of the Persian Gulf. There is no perennial river flowing across Saudi Arabia today, but there is evidence that such a river did flow there sometime in the past. Only four inches of rain a year now fall in Saudi Arabia, but during the periods from about 30,000 to 20,000 years BP (before present) and from about 10,000 to 6,000 years BP, the climate was much wetter than it is today. Even as late as 3500 BC (before Christ), ancient lakes are known to have existed in the 'Empty Quarter' of Saudi Arabia, which is today the largest sand desert in the world."[19]

However, it is difficult to believe that if Moses was describing an ancient river of some prominence *in his day*, all references to that river would be lost to history.

## Does Genesis intend to place Eden in the real world?

Some people acknowledge the evidence against placing Eden in Mesopotamia and thus conclude that Genesis never intended to give an actual geographic location for Eden in the first place. Ryle gives a classic expression of this view:

> "The account which follows (11–14) is irreconcilable with scientific geography. But the locality of the garden planted by the Lord God, containing two wonder-working trees, is evidently not to be looked for on maps. In the description of the four rivers, we must remember that the Israelites possessed only a very vague knowledge of distant lands. They depended upon the reports of travellers who possessed no means of accurate survey. Mediaeval maps often present the most fantastic and arbitrary arrangement of rivers and seas to meet the conjectures of the cartographist. We need not be surprised, if the early traditions of the Hebrews claimed that the four greatest rivers of the world had branched off from the parent stream, which, rising in Eden, had passed through the garden of the Lord God."[20]

Similarly, Tremper Longman hypothesizes:

> "Perhaps Eden is not a real place, but rather contributes to a figurative description of the origin of humanity. If so, we still need to ask what the imagery points to. The best answer is that Eden, whose very name means abundance or luxury, indicates that God provides all of humanity's needs and more when they were first created."[21]

However, this sort of 'unearthly geography' would be unprecedented in Scripture. As Kidner points out in his commentary, "verses 10–14 go to some lengths to present it as an actual, not an allegorical or mythical spot."[22] And Genesis

2 has the hallmarks of a genuine geographical description from an eyewitness. While the exact nature of the *toledoth* in Genesis has been debated in creationist circles, most would agree that they bear witness to eyewitness information.[23]

Of course, there is nothing in the Bible itself to support Ryle's assertion that these people were ignorant of the lands around them. In fact, the Israelites were of Mesopotamian extraction (Terah, Abraham, Sarah, Rachel, Leah, and the 12 tribal patriarchs were born there, and Jacob lived there for many years), used a legal code similar to those in use in Mesopotamia,[24] built houses in a Mesopotamian style,[25] and spoke a Semitic dialect similar to those in north-west Mesopotamia, and all this was true after hundreds of years in Egyptian bondage. And it is hardly fair to compare Medieval maps with the knowledge of people in 2000 BC or earlier, especially since somewhere in between people invented complex astronomical predictors like the Antikythera mechanism[26] and had calculated the circumference of the earth with amazing accuracy.[27]

## Was the description of Eden intended to be intelligible to a post-Flood audience?

One assumption some interpreters make is that the geographical details in Genesis must have been intelligible to readers *at the time of authorship.* While true, if Moses was acting as the editor of some sort of written tradition (not out of the question), accurate geographical details about the pre-Flood world could have carried over from those documents to Genesis.

Where would Moses get these pre-Flood documents? While many have pointed out that there was substantial overlap in the long lifespans of the patriarchs both pre- and post-flood, there is no indication in Scripture that this is how a record was passed down. In fact, Noah and his sons disappear from the narrative before the Babel narrative, even though they all were alive at that time. By the time Abram comes on the scene, he is an idolater and there is very little evidence of established worship of Yahweh anywhere (other than the presence of Melchizedek later in the Abrahamic narrative).

Hughes communicates this option well, despite holding to the less popular theory that the *toledoth* of Genesis are colophons.[8] He argues that "a major portion of the book of Genesis was not in fact composed by Moses, but by others, including Adam (whether written or handed down orally)." In his paper he notes the generic nature of names of pre-Flood places:

> "Of the eight geographic locations mentioned in Genesis 2, only three (Tigris, Asshur, Euphrates) are easy to locate in modern geographic terms, and then only if interpreted in a particular way (e.g. reading Asshur as a city rather than as a territory), and only if it is assumed that Moses wrote Genesis two for a contemporary audience. ... Rather than being a straightforward matter of mapping the references in Genesis two to modern geography, it appears from the evidence that it may not be possible to identify Eden's location, even in general terms. The evidence in fact points more clearly to a unique pre-Flood geography and the reuse of general terms for geographic terms in a post-Flood context."[8]

Even Munday concedes: "Moses may have relied on earlier records (both oral and written), and interpolations were probably made after him by copyists."[9]

## Conclusions

If one assumes biblical inerrancy and that Genesis 2 gives us an actual geographical description of a real place, the text gives three options for interpretation. Each of these views has been held by biblical creationists who were inerrantists, so it is important to understand that scholars struggle with these concepts. Let us then look at each view to see which best fits the biblical and geographical evidence.

### Option 1: Pre-Flood and post-Flood designations are identical

The first option is that the Havilah, Cush, Assyria, Tigris, and Euphrates in Genesis 2 are the same as their post-Flood designations.

As we noted, this option fails to appreciate the devastation the Flood would have had on the continents, literally reshaping the surface of the planet as miles of sediment were eroded and laid down. Furthermore, as we have shown, it is impossible to match the Bible's geographical description with the names in Genesis 2. So while biblical creationists such as Luther, Calvin, and many others held this view historically, it is no longer a viable biblical creationist option in light of current geological knowledge.

### Option 2: Post-Flood places are re-named from pre-Flood places

The most common modern creationist explanation is that early post-Flood people renamed landmarks after places they remembered from the pre-Flood world. While this is probably the case for the Hiddekel and P'rath, we know for instance that post-Flood Cush was named after a descendant of Ham, and there were multiple Havilahs, and so on. So these post-Flood places were demonstrably named after post-Flood people, meaning that in these cases simple renaming is not the full explanation (though it is certainly closer to the mark than option 1).

Option 3: Pre-and post-Flood places share certain popular, generic names

The third and best option, in our view, is to acknowledge that in the ancient world, many places were named with such generic descriptors that they could appropriately describe more than one place. The biblical record establishes that there was more than one Enoch and more than one Havilah, and the name data we have in Scripture for that time period is sparse! If *people's* names could be reused on such a scale, then surely it is not a stretch to imagine that generic names could also be reapplied to places. So post-Flood Havilah (the place) was named after post-Flood Havilah (a person), who happens to share the name with pre-Flood Havilah (the place, but possibly also an unnamed pre-Flood person).

Thus, we conclude there are no textual, geographic, linguistic, or even probabilistic reasons to hold to a near-Mesopotamian Eden. The few words used in parallel before and after the Flood are easily explained and the specific geography given in Scripture does not match anything in the region, nor indeed anywhere on the earth today. In part 2 of this paper we will discuss additional physical and textual considerations that argue even more strongly against a Mesopotamian Eden.

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# Our eternal universe

*John G. Hartnett*

Big bang cosmology presents several futures for the universe within the secular worldview. A few of them lead to an inevitable winding down of the universe and its eventual heat death. All possible big bang scenarios result in the dismal end of everything. Decay processes are observed in nature and are described in the Scriptures, yet we also read of miraculous events, such as when our Creator God, through His sustaining power, reversed entropy, hence maintaining or reversing the state of decay. A new biblical hypothesis is presented, based on an understanding of relevant scriptures, wherein even though that decay is continuing in this universe, God will at some stage reverse those losses and bring the universe into a state that will endure forever.

Much has been written about the universe, with its alleged big bang origin 13.8 billion years ago,[1] with its expansion forcing all galaxies away from each other. And about two decades ago it was 'discovered' that the expansion is accelerating, driven by some very strange form of energy—dark energy—that acts like an antigravity force, which is stranger than fiction. Yet the big question remains. *What is the ultimate fate of the universe?* Secular cosmology does not have a precise answer, and I describe several of their scenarios below. However, I believe that the Bible has the answer to this question. That answer may seem to many to be contrary to known science, but the same could be said of the creation of the universe from nothing, whether it be by the action of the Creator God or by secular physics invoking some quantum fluctuation of a metastable false vacuum.

## Big bang fate of the universe

Some believe the universe will eventually die in a 'big rip',[2] where space is literally ripped apart. This is alleged to result from the unlimited acceleration of the expansion of the universe due to an unbounded increase in some very strange stuff called dark energy, for which laboratory science knows nothing. In that theory dark energy eventually becomes so strong that it completely overwhelms the effects of the gravitational, electromagnetic and weak nuclear forces, resulting in galaxies, stars, and even atoms themselves being literally torn apart at their core (see figure 1).

Others believe that the universe will end in a 'big crunch'.[3] "Their calculations suggest that the collapse is 'imminent'—on the order of a few tens of billions of years or so—which may not keep most people up at night, but for the physicists it's still much too soon."[4] The big crunch is theorized to occur when the vacuum energy density (cosmological constant) becomes negative due to a change in some hypothetical scalar field changing sign. Details don't really matter because it is really just 'scratchings' on pieces of paper.

Yet another option, they say, is that the universe will end in some unremarkable heat death, where every physical process just peters out. This is known as the 'big chill', 'big freeze' or 'heat death'. In that view, the universe continues expanding while gradually all thermodynamic free energy is dissipated, meaning that all motion eventually ceases. Over a hundred trillion years or so, they say, it comes to a state of maximum entropy at a temperature very close to absolute zero, when the universe simply becomes too old and too cold to sustain life. All that they expect to remain are cold, dead stars, cold, dead planets, and black holes.

These three scenarios (figure 1) are what comprise the secular belief system, the worldview most widely held by cosmologists today. It is based on pure materialism, that matter and energy is all that there is. The atheists believe there is no creator, no God who loves us or has any personal interest in our destiny. Their beliefs are really pagan philosophy.[5]

Biblical creationists hold a different set of beliefs. They agree with an origin in time, but by fiat creation from the hand of the Creator, but many also have argued for, or agreed with, an expanding universe.[6] Some unwise biblical apologists[7] have even used the big bang origin as an apologetic defense of the Genesis 1 description, which includes an origin in time.[8,9]

## Biblical fate of the universe

There is one question, though, that remains unanswered in the biblical creationist literature. What is the expected fate of the physical universe? Is it eternal or temporary? What can we expect and what does God say in the Bible about the temporal existence of stars, and hence galaxies, in the future?

The big bang theory is based on an expanding universe, but I have examined the evidence for and against expansion and found it equivocal.[10] As a biblical creationist I

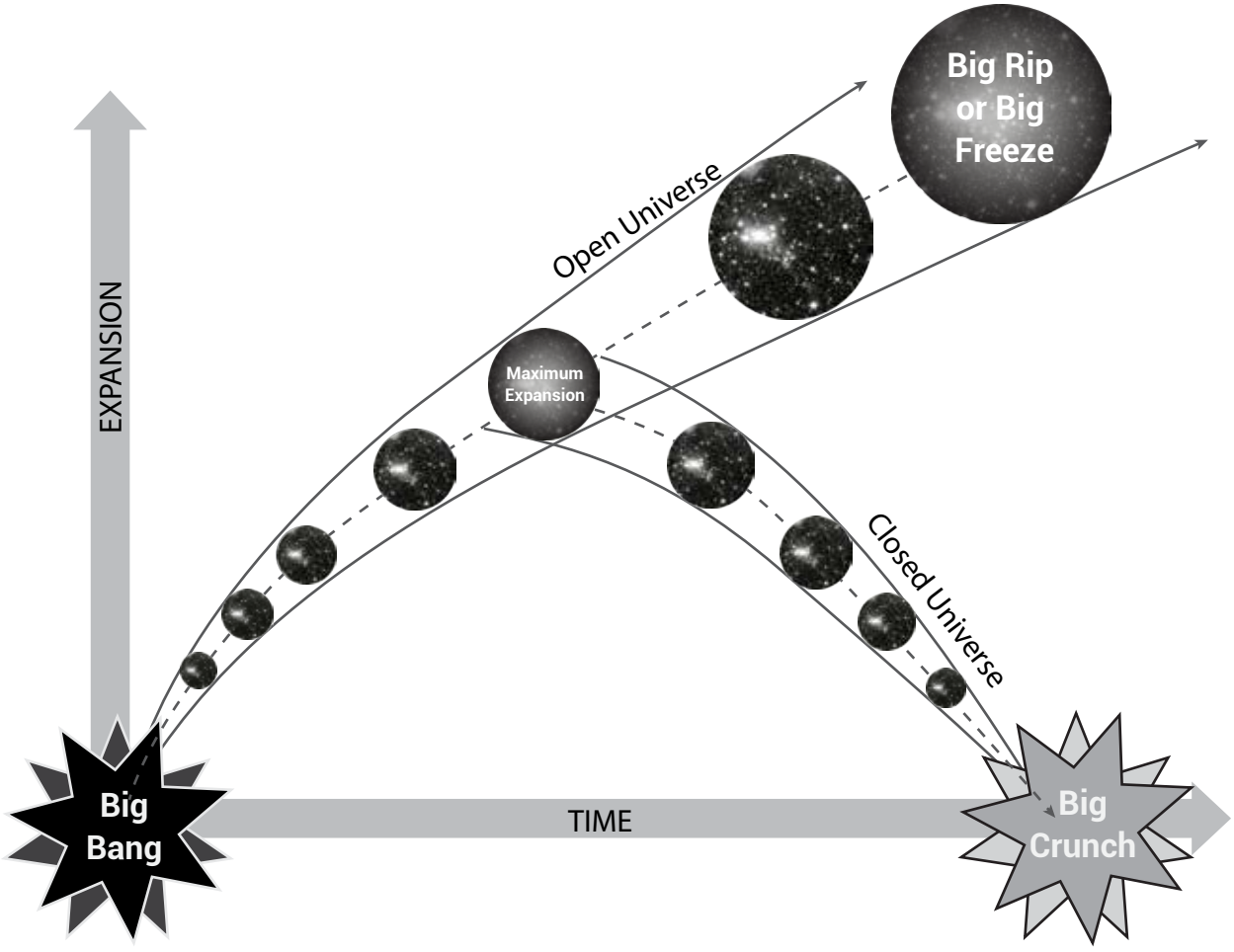


**Figure 1**. The theorised expansion of a closed universe from a 'big bang' to a 'big rip' (or 'big freeze') and a contraction to a 'big crunch'

believe one should use the Bible as the foundation of any cosmology.[11] So does the Bible really describe

1. an expanding universe, and/or
2. a temporary universe?

I have dealt with the first point before.[12] There I found that the oft-quoted scriptures, which include Hebrew words, נָטָה (natah), meaning *to stretch or spread out*, רָקַע (raqa), meaning *spread out by pounding, like thin metal sheet* and מָתַח (mathach), meaning *spread out, as a tent to dwell in*, cannot be used for cosmological expansion. None of those words ever have the meaning of cosmological expansion like in the rubber-sheet analogy of modern big bang cosmology. I believe that eisegesis is used to get these words to say what the authors want.[13]

And it would seem also that an expanding universe, hence ultimately one that dissipates, is not consistent with an eternal universe. Therefore, the universe is either expanding and temporary or it is static and eternal. This is the necessary choice we have to make in our considerations here.

So what of the second point? *Is the universe eternal or temporary?* Will it die out, be destroyed, or remain forever?

We know from science (the Second Law of Thermodynamics) and from the Scriptures (Hebrews 1:10–12, quoting Psalms 102:25–27) that inexorable decay in all physical systems is unavoidable. So, how can the universe be anything but temporary? Surely, science tells us that it will ultimately decay, and hence it cannot be eternal. On the other hand if the universe is eternal, what must the Creator do to maintain it?

In the 24th chapter of Matthew's gospel we read:

"Heaven and earth shall pass away, but My words shall not pass away" (Matthew 24:35).

Yet also we read in the Psalms it is written:

"Praise you Him, sun and moon; praise Him, all you stars of light! 4 Praise Him, you heavens of heavens, and you waters that be above the heavens! 5 Let them praise the name of the Lord, for *He commanded and they were created.* 6 *He has also established them for*

*ever and ever; He has made a decree which shall not pass* [emphasis added]" (Psalms 148:3–6).

The latter is a clear reference to a created yet an eternally existing universe. That is, a universe that was created in the finite past yet exists eternally, never to vanish or be eviscerated. The sun, moon, and stars are specifically mentioned; that they will exist "for ever and ever". It is by decree of the Creator and that decree will never be cancelled.

Then, when speaking of God's promise to the offspring of David, that is, Christ and His longevity and His rule on His throne, King David was inspired to write:

"It shall be established for ever as the moon, and as a faithful witness in heaven" (Psalms 89:37).

The promise of God here is established forever, in the same way that the moon is established forever.

These verses from the Psalms are not prophetic, nor are they intended as allegory, or just poetry but are stating facts regarding God's creation. That is, that the sun, the moon, and the stars in the cosmos are to be there forever. The Hebrew word used in both Psalms 89:37 and 148:6 is עוֹלָם (`owlam), which generally has the meaning of 'time out of mind (past or future)', but practically means 'eternity' and is frequently translated as 'always'.

Therefore, how do we interpret Matthew 24:35 "Heaven and earth shall pass away, but My words shall not pass away"? I say this is actually a verse supporting the fact that the cosmic heavens, earth, moon, and sun will be preserved forever. The text is saying that God's words will be preserved longer than the heavens and the earth.[14] My claim here may seem to be the opposite of what Matthew 24:35 seems to be saying from the English translation, but we can get clarity and a correct understanding of the intent of Jesus' statement from the equivalent verse in the gospel according to Luke. Jesus said:

"And it is easier for heaven and earth to pass [away], than one tittle [tiny stroke of a letter] of the law [the Word] to fail" (Luke 16:17).

Jesus is not actually saying heaven and earth will pass away, but that it would be easier for them to do so than it would be for God's words to fail. Since the Word of God will never fail, it will be preserved forever. Contrasted to that are the heaven and the earth, which are more likely to pass away, yet will be preserved for a very long time. And that length of time is an eternity, which we know from Psalms 148:6 and Psalms 89:37. These Psalms are not written as prophecy nor in any way are they allegorical or symbolic, but are clear statements of fact. There are yet other verses, in particular Isaiah 65:17 and Revelation 21:1, which on the surface seem to be stating that the heaven and the earth (the universe) will be destroyed if God is going to make 'a new heaven and a new earth'. Yet I would argue that those verses are prophetic and therefore are subject to the details of your eschatology, as to what they actually mean. I have formed my own views about that and believe that based on the evidence of the scriptures the 'new heaven and new earth' are, in terms of the physical environment, no more than a renovation or refurbishment of the current earth and its atmospheric heavens.[15,16]

Once we accept the fact of the eternal preservation of the heavens, by God's sustaining power, which was observed in action in the burning bush albeit for a short period of time (Exodus 3:3), 2 Peter 3:10 also becomes clear. The 'elements' there are not subatomic particles but the fundamental principles upon which the earth has been governed to this point in time. At the day of the Lord, when Christ returns (here's where eschatology comes in), God destroys the 'old order', bringing in His rule not only in heaven but on earth. The passage "the earth also and its works will not be found" makes no sense interpreted literally. The 'earth' symbolizes earthlings (inhabitants of the earth), not the planet itself. This is evident because the 'earth' has 'works' and only people can have works. It is true that the works include mankind's creations, and I believe that that is one reason God will refurbish the earth. But when God judges those works by fire at the great white throne judgment (Revelation 20:11) it is people He will judge, and those people not found in the book of life—i.e. not saved—will be cast into the lake of fire (Revelation 20:13–15).

So my argument here is that based on Psalms 148:6 and 89:37 God will preserve the starry heavens forever, i.e. for an eternity. This is a promise of God's intention.

Therefore it follows that even though the heavens are perishable God will preserve them forever. God must sustain them in the same way He sustains the creation now, but with an increase in His sustaining power. He showed us some of His sustaining power in *the burning bush* when He spoke to Moses from it (Exodus 3:3). The bush burned but did not burn up. Initially the bush must have started to burn, releasing carbon dioxide, water, and heat, and as such entropy must have increased in the system. But then it must have reached a steady state, else it would have died away. Or it could have been that God actually reversed the net entropy in the system bringing it to a state where it was burning strongest and maintained that level of burning but with no further increase in entropy. So the change of total entropy of the system (of the bush, air, and products of combustion) may have looked similar to the broken curve in figure 2. Instead of it continually increasing , when God intervened, for a period it reduced then eventually became constant, and remained so for as long as God needed to speak from the burning bush to Moses. In a similar fashion, yet in a way that is not so obvious, the Creator will sustain this universe forever. Figure 2 describes a finite universe undergoing normal increase in entropy (decay) until, by

the action of the Creator at some point in time, entropy is reversed and it eventually comes into a steady state (with zero further increase), providing the necessary conditions for an eternal universe.

God currently sustains the creation by sustaining the laws of physics, which keep things doing what they are doing. Those laws do not change or evolve.[17] Atoms are maintained; they do not evolve. Energy levels are unchanging and nuclear forces preserved at the current values. All the forces of nature are maintained in such a way that the universe, and our local universe in particular, is maintained for life to exist. Those laws are unchanging in time,[18] as reflected in the idea that Isaac Newton understood, that God actively superintends the universe. He understood that the laws of nature are the result of Divine creation and hence that they are unchanging in time. He wrote:[19]

> "And from true lordship it follows that the true God is living, intelligent, and powerful; from the other perfections, that he is supreme, or supremely perfect. He is eternal and infinite, omnipotent and omniscient; that is, he endures from eternity to eternity; and he is present from infinity to infinity; he rules all things, and he knows all things that happen or can happen."

Regardless of one's particular eschatological belief concerning where the planet undergoes major changes with the coming *Day of the Lord*, it would seem from the Scriptures that the starry heavens are to be preserved forever and as such the universe is eternal. Only the eternal God, the Creator of all, can preserve that which has a natural tendency to decay. But He has told us in His Word that He will keep the sun, moon, and stars forever and ever.

This view may be surprising to some. We have been taught that everything decays. However, the Bible describes aspects that can only be understood in terms of the *reversal* of decay. Examples are the burning bush (Exodus 3:3), the clothes and sandals of the children of Israel that did not wear out during the forty years they were in the wilderness (Deuteronomy 8:4, 29:5), Naaman healed of leprosy, his flesh restored to normal (2 Kings 5:14), Lazarus raised from the dead after being dead four days (John 11:38–44), Christ's Resurrection from the dead (Mark 16), and several other resurrections. All of these examples involve a reversal of entropy (decay processes). They are exceptional, granted, but they demonstrate the power of the Creator when He either adjusts rates of physical processes or reverses them entirely.

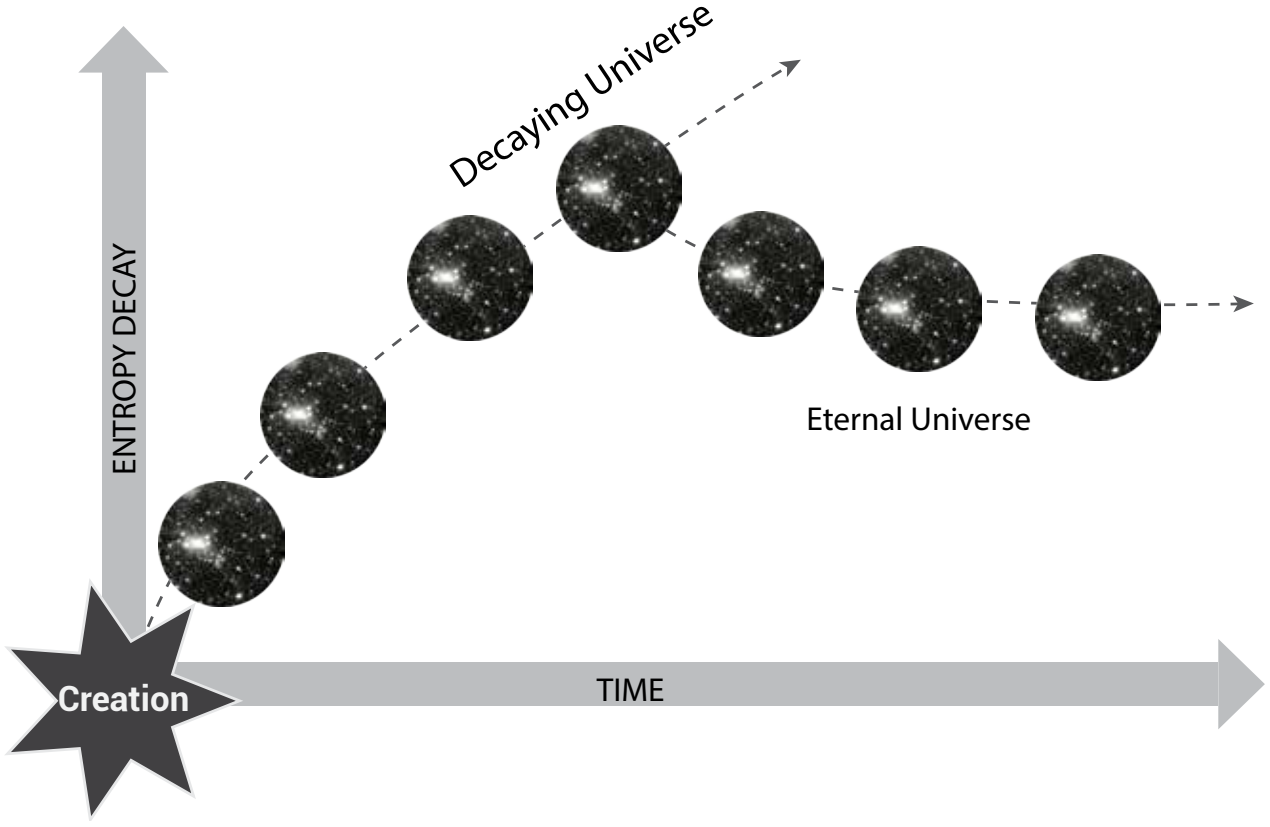


**Figure 2.** A finite static (non-expanding) universe undergoing normal decay until the hand of the Creator reverses entropy and establishes the conditions for an eternal universe. The stars and galaxies are preserved forever. Note: the vertical axis in this case is not expansion but entropy.

## The universe we observe

The universe we observe is subject to this inexorable decay. But the usual assumption is that the physics of the universe locally is the same physics that operates everywhere else in the universe. The *cosmological principle* is normally defined as that no matter where an observer might be in the universe he would observe the same as we observe locally. Another aspect of that same *cosmological principle* is that the laws of physics are the same everywhere in the universe. This is an assumption nevertheless.

And as a result when the speeds of rotation of spiral galaxies are assumed to be subject to the same Newtonian Law of Gravitation, spherical halo dark matter is required to explain what would otherwise be anomalous behaviour. Similarly, when the masses of spherical galaxies and clusters of galaxies are calculated from their X-ray emissions, invisible dark matter is again invoked to explain otherwise anomalous behaviour.[20] But these calculations are based on the over-riding assumption that what we know as standard physics applies over the length scales and timescales of the galaxies and the clusters of galaxies. In addition, the same assumption is made concerning the scale size of the universe and the 13.8-billion-year timescale of its assumed history since the alleged big bang.[21]

But what if those assumptions are not correct? If they are not, it does not necessarily mean that the laws themselves are different but that the usual secular assumptions on the boundary conditions (i.e. the origin and age of the universe and its constituents) may be wrong. What if the universe (that we can see) has only been in existence for the past 6,000 years, as the book of Genesis indicates? What if the requirement to invoke dark energy and dark matter results from a lack of knowledge of the correct physics on galactic, supergalactic and universal scales? In such a case it does not mean, necessarily, that the physics is different in different parts of the universe, but only that it is different on larger and larger scale sizes, which is something we cannot locally test for—we are too small. What if the *cosmological principle* is actually wrong and the assumption that it is valid has led to this state of affairs. Our region of space may be unique and special and that may change how we model the observations as compared with assuming there are no special places.

Only recently has the scientific community been able to make precise and accurate measurements on astrophysical processes. Thus we have very little real time information on those processes in the universe over timescales more than about 50 years. Hence we are limited in our knowledge of very long-term changes. As a result we can only draw assumptions, like the belief that the Second Law of Thermodynamics applies universally and will apply over all time. Another major assumption is that that which is observed at any particular redshift represents real history for the whole universe when it was at that same cosmic time, as calculated from the assumed model, even though we can only observe one thin slice at any particular redshift.

So what if none of these assumptions are correct? What if the universe we observe on vary large scales, in general, is not subject to the inexorable decay? Or it could be that at some future time, not yet observable, that decay will be reversed.

The application, then, of the wrong assumptions has led in fact to the ludicrous state[22] of cosmology today, with its insistence on dark matter, dark energy, dark radiation, even dark 'photons', for which there is not one shred of experimental local laboratory evidence.

I could suggest an alternative—that direct causation by the Creator has been ignored because He does not fit the standard worldview called *materialism*. The Creator is not discoverable, yet neither is He excludible with current methodological science, so, by definition, He falls outside of 'science' and thus His creative power is not considered. What, after all, should a freshly created universe look like? What should the hallmarks of fiat creation be?

The universe was created, that we know for sure (Genesis 1:1), so why look solely for a naturalistic description of that which is truly supernatural? God may already have applied some additional sustaining power to the universe, which needs to be taken into account. Ignoring that fact could well be the reason that the stars in the arms of spiral galaxies do not follow the expected standard laws. Thus on the larger-length scales it could be interpreted as new physics but actually it is not new but has been in place all along. We have just not recognised it.

This sustaining power of God might be construed as a 5$^{th}$ force in the universe, one that is creative, conservative, maintaining the high speeds of the spiral arm stars without the need for halo dark matter. And thus dark matter and other fudge factors would no longer be needed to describe the motions in the universe. To suggest so would probably be laughed at or scorned by secular science. But in such a case, it may be incorrectly interpreted as new physics. With such a conservative power capable of reversing entropy (over very long timescales) it is possible that the universe is here forever.

One of the reasons this type of creative force is not detected may be that the Creator is, by definition, excluded and thus no theory can allow for such influences. Also, the timescales for any entropy-reversing processes are much greater than human life times and as such we have no available data; or the processes, like dark energy, cannot be detected on any local scale. Not yet anyway, when the effect is too weak. Understanding this goes to understanding the

true cosmogony of the universe, how and when God created all the stars and galaxies.

Such an entropy-reversing force need not be acting continuously, but is only needed when it suits God's purposes, as was the case in the burning bush, raising people from the dead, etc. The very existence of the universe begs a creator so why not a creator who preserves His creation, even if some parts of it have to undergo renovation sometimes. This, I believe, is indicated in the language of God's renewal of the earth, not its total destruction and recreation, when He said He will make a new heaven and new earth.[15]

## Conclusion

The world looks forward to a dismal fate as the universe eventually dies in a 'big rip', 'big freeze' or a 'big crunch'. Without trust in the Creator and His Word the world has no hope. Their only comfort is that the ultimate death of this universe is expected to be so far off in the distant future it can be ignored. But the Bible describes catastrophic world-changing events not so far off, only a matter of thousands of years, not billions or trillions. God has told us this in His Word. And though there are several different interpretations among Christians, the general consensus among those who take God's words as they were intended to be understood is that it is only a matter of a thousand years or more before major changes are expected on Earth and even in the universe.

Only about 6,000 years ago this world—the whole universe—was created. But soon after it was damaged by sin. However, we look forward to the restoration of the fallen world in the *new heaven and new earth* as promised in the Revelation (Revelation chapters 21 and 22), wherein there is only perfection. The concept of an eternal universe then fits this concept, as those who are saved live forever with the King of kings and Lord of lords when He rules the universe from His throne.

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# Creation perspective of nucleocytoplasmic large DNA viruses

*Jean O'Micks*

The large-sized genomes and unique gene content of nucleocytoplasmic large DNA viruses (NCLDVs or giant viruses (short: giruses)) have become the focus of attention in recent research. Some evolutionists claim with much fanfare that these viruses form a new 'fourth domain' of life besides eukaryotes, bacteria, and archaea. They believe them to have degenerated from the eukaryotic nucleus, and that they harbour genes from eukaryotes, bacteria, and archaea through horizontal gene transfer. The presence of genes from cellular organisms suggests that giruses actually could be degenerate bacteria. Evolutionists delineate about 50 core genes with varying distribution in the genomes of seven NCLDV families, purportedly demonstrating their monophyly. Upon closer examination this is not warranted, since only 14 of these genes are unique to NCLDVs, whereas other genes are most probably found in bacteria. NCLDVs also contain a high ratio of ORFan genes, without homologs in other species, supporting their independent origin apart from other organisms. Thus, the fact that most girus genes might not have originated from one of today's three cellular domains helps further the spectrum of intelligent design.

During the past 15 years, a number of genetically diverse microorganisms with interesting characteristics have been discovered, with implications for the creation/evolution debate. They are called nucleocytoplasmic large DNA viruses, or NCLDVs,[1] since their life-cycle is attached mainly either to the cytoplasm or the nucleus of host cells. According to one taxonomical division, they have been grouped into the order Megavirales.[2] They are peculiar in that they have large genomes (ranging from 0.1–2.5 Mbp),[3,4] with up to 2,500 coding sequences; even surpassing those of bacterial or even eukaryotic species, and share certain characteristics with cells. Due to their size, their proteins are incapable of self-assembly, which denotes that they need complex proteins in order to self-assemble.

Their genomes can be made up of both DNA and RNA. Their genomes contain ORFs numbering in the hundreds, which also encode enzymes, such as ones which take part in sugar metabolism. Just like Russian nested dolls, some of these viruses themselves harbour viruses. For example, a variant of the mimivirus, called mamavirus, contains a small, 50-nm-size virus with a couple of dozen genes, called Sputnik.[5]

NCLDVs are classified into seven families, based on virion morphology and host range, and are listed and characterized in table 1. According to other classifications, giant viruses, include viruses which exceed 500 Kbp in genome size. Other DNA viruses with genomes in the size range of 100–280 Kbp are called large DNA viruses (ascoviruses, asfarviruses, baculoviruses, herpesviruses, iridoviruses and some bacteriophages), whereas the ones with very large genomes are called giant viruses, or 'giruses'. Newly discovered viruses such as the Pandoraviruses and Pithoviruses are being considered as new families,[3] although, according to some studies, Pandoraviruses are derived phycodnaviruses.[6] Some NCLDVs also contain introns and inteins, which is not characteristic of viruses.

Some evolutionists claim that NCLDVs predates the origin of the eukaryotic cell, and serve as precursors to the eukaryotic nucleus.[7] NCLDVs also have an important role in horizontal gene transfer (HGT) between species.[8] Because of these peculiar characteristics, scientists are designating these interesting viruses to a new, fourth domain of life besides eukaryotes, bacteria, and archaea, thus broadening the classical conception of viruses which were originally defined as subcellular infectious particles.

However, some NCLDV species, such as Mimivirus, contain genes only found in soil bacteria. Thus it might be that NCLDVs are not really viruses but rather degenerate bacteria which acquired viral genes, such as viral capsid proteins. For example, Mimivirus contains a number of genes which are characteristic of only cellular organisms, such as aminoacyl-tRNA synthase;[9] a vacuolar sorting-associated protein, a Cu/ZN superoxide dismutase, a UDP-N-acetylglucoseamine2-epimerase, a dTDP-4-dehydrorhamnose reductase, a dTDP-d-glucose 4-6 dehydratase, and an ExoV-like protein.[10] Fischer *et al.*[11] report 14 genes from *Cafeteria roenbergensis* virus, which resemble bacterial genes, and of which seven are involved in carbohydrate metabolism. If NCLDVs were really viruses, the presence of cellular genes truly would be an inexplicable anomaly. Other genes include topoisomerase IA, IB, and IIA, which are involved in unwinding DNA

**Table 1.** Characteristics of the seven families of NCLDVs

| Family | No. of genera | Genome size range | Number of genes | Hosts | Replication origin |
|---|---|---|---|---|---|
| Ascoviridae | 1 | 119–186 Kbp | 99–110 | Insects | Nucleus and cytoplasm |
| Asfarviridae | 1 | 170–182 Kbp | 151 | Mammals, dinoflagellates | Cytoplasm |
| Iridoviridae | 5 | 102–212 Kbp | 130–328 | Insects, fish, amphibians | Nucleus and cytoplasm |
| Mimiviridae | 2 | 617 Kbp–1.3 Mbp | 444–457 | Amoeba, algae | Cytoplasm |
| Marseilleviridae | 1 | 346–368 Kbp | 95–463 | Amoeba | Cytoplasm |
| Phycodnaviridae | 5 | 154–407 Kbp | 150–886 | Algae | Nucleus and cytoplasm |
| Poxviridae | 14 | 134–359 Kbp | 544–1120 | Mammals, birds, reptiles, insects | Cytoplasm |

during replication. These genes are found in Mimivirus as well as *Pseudomonas*, *Agrobacterium*, and *Sinorhizobium* species.[12]

The designation of these organisms is problematic; they are called viruses in the scientific literature, and will technically be called such in this paper, but we maintain that these organisms are most likely degenerate bacteria.

## NCLDV ORFan genes

According to Claverie and Ogata,[13] "the disturbing fact that most girus genes might not have originated from one of today's three cellular domains only helps revive the spectrum of intelligent design". It has been reported that in several NCLDV species a large portion of their several hundred genes have no known functional homologues.[14] These genes are called ORFan genes (genes without homologues in other lineages), and their distribution is restricted to closely related species. The vast majority of ORFans are exclusive to a single virus family only. Three-D protein structure analyses demonstrate that many ORFans encode expressed proteins, although they do not contain known protein folds. For example, 300 of the 911 Mimivirus proteins have no homologs with any other protein, and only 21 were assigned recognizable structures.[15] Ogata and Claverie[12] have demonstrated that these ORFs show the same position-dependent nucleotide statistics as the rest of the genome, suggesting that these ORFs are characteristic of the host virus, and not a result of HGT. This deals a particularly deadly blow to evolution (confirming Claverie's fears) since here we have tons of unique genes which are not a result of HGT. Accumulating evidence also shows that at least some viral genes are only less similar with their host counterpart genes. Indeed, less than 35 genes from the seven NCLDV families are a result of HGT, and less than 15 in the great majority of species.[8,16] All of this supports the idea that these organisms all have independent origins.

In Pandoraviruses, 93% of ORFs have no recognizable homologs; in fact, even now evolutionists do not have a clear idea as to what other virus Pandoraviruses are related to.[4] In general, the percent of ORFan genes in different NCLDV subgroups ranges from 2.8–75.2%, with an average of 30%[17], which is significantly higher than those in bacteria (9%). Marine virome studies show that 91% of marine viral genes are new.[18]

## Distribution of ORFan genes across different NCLDV families

Boyer *at al.*[16] studied the percent of ORFan genes per NCLDV family, and found that the largest number of new genes comes from newly discovered viral families, such as Marseillevirus,[19] with up to 70% of its genes being ORFans. They also found, for example, that 2.6% of the genes in the PBCV-NY2A NCLDV genome are species-level ORFans, but 36.2% of them are ORFans at the genus level. This would indicate that for these NCLDV species, the genus is approximately equal to the baraminic boundary. In Mimivirus, only 298 of its 1,262 ORFS (24%) could be associated with functional attributes, compared to 70% in bacteria and archaea.[20] Evolutionists could claim that with the discovery of newer and newer genes and NCLDV species, the proportion of ORFan genes may decline; however, Yin and Fischer[21] found that the proportion of ORFan genes is stable, despite the increasing number of sequenced genomes, and does not depend on genome size. Table 2 shows the percentage of homologs per total proteins for NCLDVs in the COG database for each of the 49 NCLDVs in this study.

**Table 2.** Percentage of homologs per total proteins for NCLDVs in COG database. Proteins were blasted against protein sequences from the Uniprot website for 10 major taxonomic categories: archaea, bacteria, fungi, human, invertebrates, mammals, plants, rodents, vertebrates, and viruses. A maximum e-score cutoff of 1e-4 was applied to determine homology.

| Species | Family | No. homologs | No. proteins | Homolog / protein % |
|---|---|---|---|---|
| Invertebrate iridescent virus 3 | Iridoviridae | 117 | 125 | 93.6 |
| *Acanthamoeba polyphaga* mimivirus | Mimiviridae | 876 | 979 | 89.48 |
| African swine fever virus | Ascoviridae | 142 | 160 | 88.75 |
| *Acanthamoeba castellanii* mamavirus | Mimiviridae | 872 | 988 | 88.26 |
| Vaccinia virus | Poxviridae | 183 | 223 | 82.06 |
| Frog virus 3 | Iridoviridae | 75 | 99 | 75.76 |
| Myxoma virus | Poxviridae | 97 | 169 | 57.4 |
| Yaba-like disease virus | Poxviridae | 82 | 151 | 54.3 |
| *Wiseana iridescent* virus | Iridoviridae | 90 | 193 | 46.63 |
| Squirrelpox virus | Poxviridae | 63 | 141 | 44.68 |
| *Acanthamoeba polyphaga* moumouvirus | Mimiviridae | 377 | 891 | 42.31 |
| *Megavirus chiliensis* | Mimiviridae | 473 | 1120 | 42.23 |
| Orf virus | Poxviridae | 54 | 130 | 41.54 |
| Canarypox virus | Poxviridae | 131 | 328 | 39.94 |
| *Molluscum contagiosum* virus subtype 1 | Poxviridae | 63 | 163 | 38.65 |
| Invertebrate iridescent virus 6 | Iridoviridae | 174 | 467 | 37.26 |
| Nile *crocodilepox* virus | Poxviridae | 42 | 173 | 24.28 |
| Singapore grouper iridovirus | Iridoviridae | 38 | 161 | 23.6 |
| *Spodoptera frugiperda* ascovirus 1a | Ascoviridae | 17 | 122 | 13.93 |
| *Trichoplusia ni* ascovirus 2c | Ascoviridae | 22 | 163 | 13.5 |
| *Cafeteria roenbergensis* virus BV-PW1 | Mimiviridae | 69 | 544 | 12.68 |
| *Paramecium bursaria Chlorella* virus NYs1 | Phycodnaviridae | 45 | 374 | 12.03 |
| *Micromonas sp.* RCC1109 virus MpV1 | Phycodnaviridae | 29 | 244 | 11.89 |
| *Ostreococcus tauri* virus 1 | Phycodnaviridae | 24 | 230 | 10.43 |
| *Ostreococcus lucimarinus* virus OlV1 | Phycodnaviridae | 26 | 250 | 10.4 |
| *Bathycoccus* sp. RCC1105 virus BpV1 | Phycodnaviridae | 21 | 203 | 10.34 |
| *Heliothis virescens* ascovirus 3e | Ascoviridae | 18 | 179 | 10.06 |
| *Mythimna separata* entomopoxvirus 'L' | Poxviridae | 30 | 306 | 9.8 |
| Infectious spleen and kidney necrosis virus | Iridoviridae | 12 | 125 | 9.6 |
| Lymphocystis disease virus - isolate China | Iridoviridae | 22 | 238 | 9.24 |
| *Amsacta moorei* entomopoxvirus 'L' | Poxviridae | 27 | 293 | 9.22 |
| *Micromonas pusilla* virus SP1 | Phycodnaviridae | 22 | 242 | 9.09 |
| *Ostreococcus* virus OsV5 | Phycodnaviridae | 23 | 264 | 8.71 |
| Organic Lake phycodnavirus 1 | Phycodnaviridae | 27 | 398 | 6.78 |
| *Phaeocystis globosa* virus 14T | Phycodnaviridae | 27 | 433 | 6.24 |
| *Phaeocystis globosa* virus | Phycodnaviridae | 27 | 434 | 6.22 |

| | | | | |
|---|---|---|---|---|
| *Phaeocystis globosa* virus 12T | Phycodnaviridae | 27 | 439 | 6.15 |
| *Anomala cuprea* entomopoxvirus | Poxviridae | 16 | 263 | 6.08 |
| Melanoplus sanguinipes entomopoxvirus | Poxviridae | 16 | 267 | 5.99 |
| Organic Lake phycodnavirus 2 | Phycodnaviridae | 19 | 326 | 5.83 |
| *Ectocarpus siliculosus* virus 1 | Phycodnaviridae | 12 | 240 | 5 |
| Lausannevirus | Marseillevirus | 20 | 442 | 4.52 |
| *Acanthocystis turfacea* Chlorella virus 1 | Phycodnaviridae | 34 | 860 | 3.95 |
| Marseillevirus | Marseillevirus | 16 | 428 | 3.74 |
| *Feldmannia* species virus | Phycodnaviridae | 5 | 150 | 3.33 |
| *Pithovirus sibericum* | Unassigned | 14 | 466 | 3 |
| *Emiliania huxleyi* virus 86 | Phycodnaviridae | 14 | 472 | 2.97 |
| *Pandoravirus dulcis* | Pandoraviridae | 32 | 1487 | 2.15 |
| *Pandoravirus salinus* | Pandoraviridae | 31 | 2543 | 1.22 |

Therefore, in order to study this, we examined the percentage of ORFans in the genomes of 53 NCLDV genomes studied by Boyer. We plotted the average proportion of ORFans per NCLDV genus as a function of the number of genomes studied per family. The result can be seen in figure 1. We fitted a curve to the points on the graph and found that a power law best describes the relationship between the number of species within a family and the average proportion of ORFans to follow the following equation: $y = 59.251\ x^{-0.301}$, with a correlation coefficient of 0.79. Based on this model, as an example, with a baramin of 1,000 members, it can be expected that 7.4% of the genes within the baramin will be ORFan genes. This means that even with baramins with a high number of members, the number of ORFan genes tends to approximate an asymptotic value, meaning that there will always be a minimum number of family-specific ORFan genes constituting a significant portion of NCLDV genomes, which do not originate from other species.

The 20,086 protein sequences for 49 NCLDV species were downloaded from the COG website and compared to protein sequences from archaea, bacteria, and eukaryotes from the Swissprot database. For each of the 49 species we calculated the percent ORFan proteins they had in their genome. On average, 75.4% of their proteins (e-score $1^{-40}$) did not have homologs with any other protein in the Swissprot database (being ORFans), similar to other results.[16]

In figure 2 we can see the average percentage of ORFs as a function of the negative logarithm of the cutoff e-value for orthologous hits between proteins. The curve follows the equation $y = -0.0026\ x^2 + 0.5283\ x + 58.784$, and has a correlation coefficient of 0.9918. As we can see, the curve steadily increases as the cutoff e-value becomes tighter (an ever decreasing e-value, which corresponds to an ever increasing neglog value). Even at a neglog e-value of 5, the average ORF content is 56%.

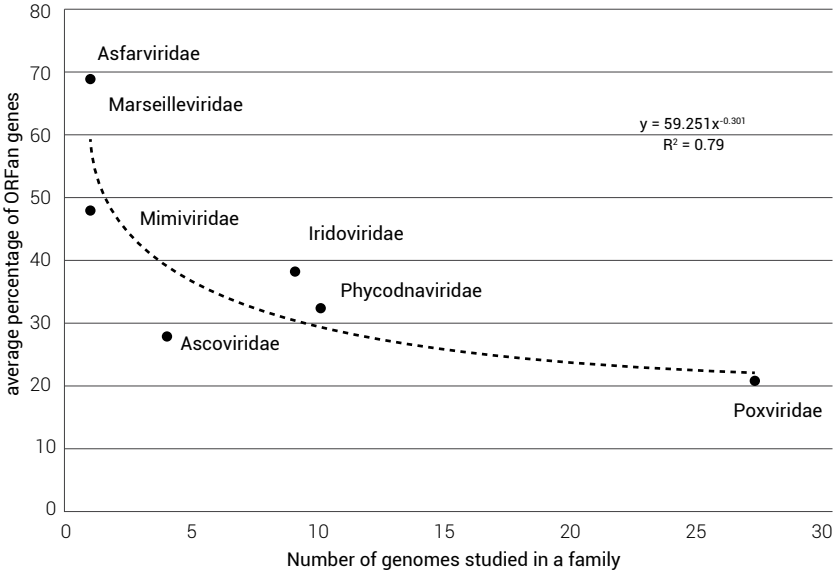


**Figure 1.** Average percentage of ORFan genes as a function of the number of genomes studied in a given NCLDV family. The points for the families Asfarviridae and Marseilleviridae overlap each other. The curve tapers off to the right, which shows that even with a high number of genomes in a given family, a substantial portion of the genes remain ORFans.

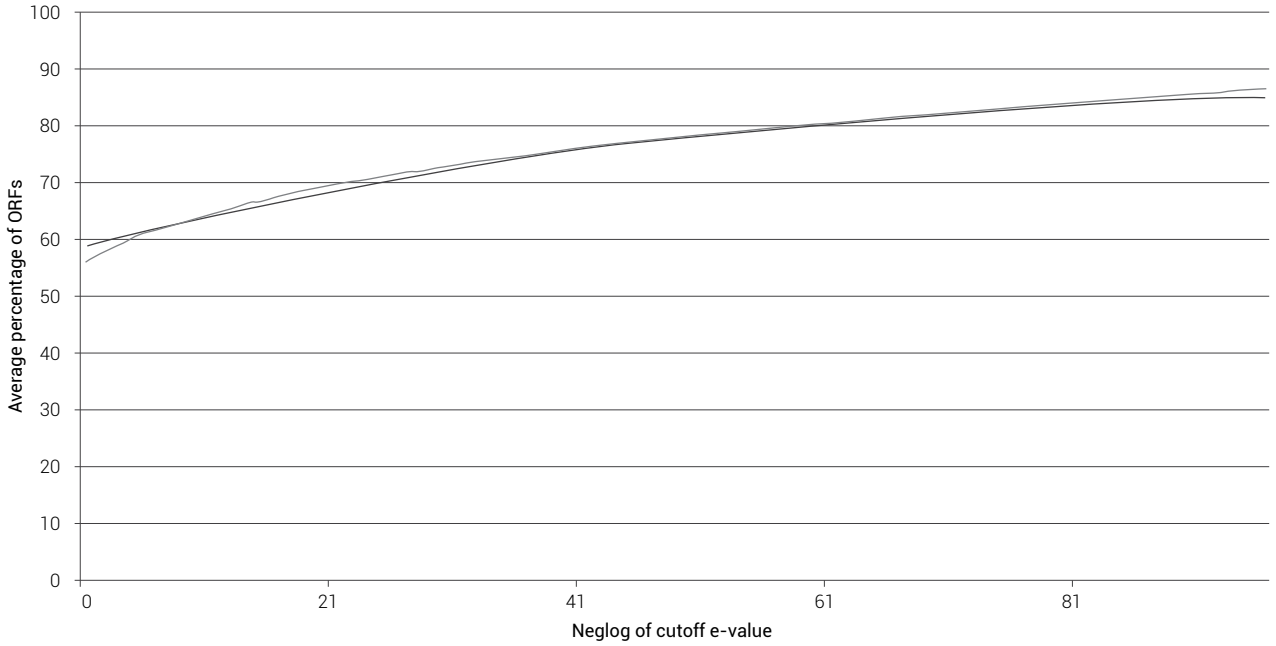


**Figure 2.** Average percent of ORFs in the 49 NCLDV species as a function of the negative logarithm of the cutoff e-value for orthologous proteins

## A closer look at the common NCLDV core gene set

Yutin and Koonin[22] described the phylogenetic distribution of the 50 core NCLDV genes in Megavirales, and found that not all members of NCLDVs contain all of these genes. These genes are thought to be important for the basic replication machinery, and that they were present in a *hypothetical last common ancestor* of NCLDVs. These genes are involved in DNA replication, recombination and repair, transcription and RNA processing, nucleotide metabolism, virion structure, signal transduction, virus-host interactions, and also in other uncharacterized processes. However, other authors point out that NCLDVs are missing genes for translation systems, such as aminoacyl-tRNA synthetase, and translation factors, such as EF1-a, eIF-4a, eIF1, and SUA5.[23]

Yutin and Koonin[21] state that phylogenetic trees failed to show an NCLDV clade, and that deviations from simple vertical evolution probably occurred in almost all of the core genes. Indeed, only 14 of

**Table 3.** List of genes from Yutin and Koonin[22] which are missing from certain NCLDV subgroups

| Gene/gene group | General functional group | Reason for exclusion |
|---|---|---|
| ATP-dependent ligase | DNA synthesis | polyphyletic |
| capping enzyme | mRNA synthesis | present in only one species of iridoviruses |
| DNA polymerase | viral replication | present in only some phycodnaviruses |
| dUTPase | nucleotide metabolism/ repair | present only in poxviruses, iridoviruses, and phycodnaviruses |
| FLAP nuclease | DNA synthesis | present in only poxviruses |
| polyA polymerase large catalytic subunit | mRNA synthesis | present in only one species of mimivirus |
| polyA polymerase small regulatory subunit | mRNA synthesis | present only in poxviruses |
| primase-helicase | viral replication | present in only some phycodnaviruses |
| ribonucleotide reductase (RR) | mRNA synthesis | present in only poxviruses and iridoviruses have different affinities |
| RNA polymerase (RNAP) | RNA synthesis | present in only majority of phycodnaviruses |
| thymidine kinase (TK) | dNTP synthesis | missing from some species across supposed NCLDV clade |
| thymidylate kinase (TMPK) | dNTP synthesis | missing from some species across supposed NCLDV clade |

the 50 genes listed in table 1 of their paper were shown to be common to all NCLDVs. The 36 other genes were either thought to be polyphyletic, too divergent in sequence, missing from a number of subgroups, or acquired from other organisms by lateral transfer.[8,24] Table 3 lists groups of genes which are missing from some NCLDV subgroups along with their function. While it could be true that gene loss occurred in multiple NCLDV subgroups, it is also possible that these genes were never lost in the first place, but rather that NCLDVs are polyphyletic, forming different baramins within a single NCLDV apobaramin. Of course, the question can still be raised, if some of these important 50 genes needed for viral replication are missing from some species, then it must follow that they aren't necessary for viral replication in the first place. The authors also apply faulty logic in assuming that the monophyly of NCLDVs is the most appropriate null hypothesis, which they were unable to reject at a statistically significant level. In statistical hypothesis testing it is easier to reject a hypothesis than to prove it to be true.

Yutin *et al.*[22] studied the number of shared gene families as well as the Jaccard similarity (a measure of gene content similarity between two organisms) of gene complements in Iridoviridae, Marseilleviridae, Phycodnaviridae, Mimiviridae, and Poxviridae. The largest Jaccard similarity they found was 36% between *Acanthamoeba polyphaga* and *Megavirus chiliensis*, 17% between *Phaecocystis globosa* and Organic Lake phycodnavirus, 11% between Invertebrate iridescent virus and Lymphocystis disease virus, and 11% between *Amsacta moorei* entomopoxvirus and Vaccinia virus. For example, three viruses from the family Phycodnaviridae, PBCV-1, EhV, and EsV have only 14 genes in common (D5-type ATPase, DNA polymerase, A32-type ATPase, A18-type helicase, a capsid protein, a thiol-oxireductase, D6R-type helicase, a Ser/Thr protein kinase, a VLTF2-like transcription factor, a proliferating cell nuclear antigen, a ribonucleotide reductase large and small subunit, an A494R-like uncharacterized protein, and a group III thioredoxin/glutaredoxin),[25] whereas combined they have over 1,000 different genes, meaning that the Phycodnaviridae family itself can be broken down into separate baramins. Six strains of *Chlorella* viruses (NY-2A, AR158, MT325, FR483, PBCV-1, and ATCV-1) however have 80% of their genes in common, meaning that it is highly likely that they all belong to the same baramin. Indeed, common gene content may serve as a good marker for inclusion of NCLDVs into the same baramin. For example, in the case of the previously mentioned six *Chlorella* species, this must mean that a majority of genes resist genetic deletion, thus they must have some important function. Also, the genome of the white spot shrimp virus (WSSV),[26] from the family Nimaviridae, is dissimilar to any other virus, questioning its monophyletic relationship within the NCLDVs.[27] Of its 531 genes, only 45 have a higher than 20% similarity to any other known protein. It is the only eukaryotic virus genome to encode a collagen-like protein.

Furthermore, many evolutionists hold that despite increases or decreases in gene content or genome size, the size of the ancestral archaea or bacterial genome was not much different than their modern descendants.[28] For example, Iyer *et al.*[23] claim that due to the presence of SWI2/SNF2-like chromatin-remodelling ATPases of helicase SFII, the ancestral NCLDV chromosome was fairly large, in need of supercoil regulation. This obviously raises the question, if the ancestor of all NCLDVs is so similar to modern NCLDVs, then when did evolution happen?

Only 6.1% of Marseillevirus ORFs belong to the core NCLDV gene set.[16] Pandoraviruses are thought by evolutionists to have a distant relationship with the 7 families of NCLDVs, yet they have only 17 of the 50 core NCLDV proteins, which is all the more significant as the two viruses studied from this group (*Pandoravirus dulcis* and *salinus*) have 1,487 and 2,543 genes, respectively, the most of any giant virus.[21] Other giant virus families, such as Myoviridae, Nimaviridae, Herpesviridae, and Polydnaviridae, have large genome sizes, but their gene content precludes them from being classified as NCLDVs[2] due the evolutionary mispreconceptions that in order for all NCLDVs to be monophyletic they all have to have the same set of core genes.

## Genome size variation in NCLDVs

As described in a previous work on bacterial genome decay,[29] NCLDVs also undergo a similar process involving gene loss. These species include poxviruses, African swine fever virus, and different species of chlorella viruses, in the range of 8–37 Kbp. For example, Mimivirus in *Acanthamoeba polyphaga* cultures can lose 17% of its genome, from 1.2 Mbp to 0.993 Mbp. This process also involves losing fibres from its surface.[30] These deletions covered 155 coding sequences, some of them duplicated genes (therefore unnecessary), and also included two uncharacterized genes from the set of core NCLDV genes, suggesting that these two genes are not absolutely necessary for function. A further 205 genes had gaps in them, being either deleted or turned into pseudogenes. This is remarkable, since in its original state the Mimivirus genome has no pseudogenes,[7] meaning that here pseudogenization was a completely downhill process. Some of these genes were involved in DNA replication and recombination, RNA processing, and translation. Some evolutionary theories have it that viruses with giant genomes acquired a lot of genes over evolutionary time from viruses with smaller genomes,[23]

yet here we have substantial downsizing of the Mimivirus in cell cultures, an evolutionary blink of an eye. This is proof that genome decay goes very fast, and hints at a recent origin, just as predicted by Terborg's baranome hypothesis,[31] which predicted the genomic breakup and decay of related organisms with a single pan-genome.

Interestingly, several NCLDV genera besides Mimiviridae have species which have large genome-size discrepancies—for example, the two *Pandoravirus* species, *dulcis* and *salinus*, with genome sizes of 1.9 and 2.5 Mbp, respectively.[4] The *Feldmannia* algal virus has two variants with different genome sizes, which are 158 and 178 Kbp, respectively.[32] Similar differences have been reported in two land species, *Arabidopsis thaliana* and *lyrata*.[33] In the current study, of 10 groups, we found several of them also showed a large within-group variation in genome size. For example, in the third group with species from Mimiviridae, genome size varied by 0.24 Mbp. In the fourth group, corresponding to ChPV species, the genome size ranged from 140 to more than 2.5 times its size, 360 Kbp, and in the fifth group (EPVs), the genome size ranged from 232 to 281 Kbp. According to Lefkowitz *et al*.,[34] "gene loss is a major mechanism responsible for genome diversity in the *Poxviridae*, and that acquisition of new genes has played essentially no role in determining the biology of individual species in the [orthopoxvirus genus]".

This means that large gains/losses in closely related NCLDV genomes (within a single group) are possible without upsetting species boundaries. Rapid large-scale genome size variation between two similar species is not what evolutionary theory predicts.

Patterns of genome decay involve loss of genes at the edges of chromosomes necessary for genetic variability, such as those which determine host-pathogen interaction, whereas more conserved housekeeping genes, such as those which are needed for replication, are located at the centre of the chromosome. Genes that have been acquired via HGT are also located at the end of the chromosome of the NCLDV.[35]

## Summary and conclusion

A major question that needs to be addressed is, what kinds of organisms are NCLDVS exactly, and how did they originate? The Bible does not mention bacteria or viruses specifically, so therefore we are assuming that if God created different kinds of macroscopic organisms, then the same kind of logic can be applied to microorganisms. Therefore, the results of the analysis presented here are somewhat tentative. If NCLDVs are viruses, then the question would arise as to why God would create such pathogenic viruses in a good world. However, it is well known that there are both harmless 'passenger' viruses and harmless bacteria that do not harm their hosts.

The high number of ORFan genes in NCLDVs is significant because it means that these organisms harbour hundreds of genes which, if they are not homologous to known genes from the other three domains of life (eukaryotes, bacteria, and archaea), also must have originated independently from the main evolutionary tree of life. The high proportion of ORFan genes in NCLDV genomes has still held, despite the increase of newer genes in public databases and the discovery of newer species of NCLDVs. NCLDVs will always contain species or genera-specific genes. This, in turn, means that NCLDVs form their own apobaramin, separate from all other organisms. The high proportion of ORFans specific to NCLDV genera implies that this is the taxonomical limit to these virus species, and that an NCLDV genus corresponds to a biblical holobaramin. Despite their lack, or low content of core NCLDV genes, we suggest that the families Pandoraviridae, Myoviridae, Nimaviridae, Herpesviridae, and Polydnaviridae also be classified into the NCLDV/Megavirales apobaramin. This way the classification of these species is not forced unnecessarily into an evolutionary system.

Interestingly, there have been reports of discovering ancient samples of 'giant viruses', such as *Mollivirus sibericum* and *Pithovirus sibericum*. Some of these virus particles have retained their infectivity after being thawed out of permafrost after supposedly 30,000 years. The Pithovirus virions resemble those of Pandoravirus, and 16% of the Mollivirus genes have homologs in Pandoravirus.[36] As another example, they found traces of RNA of a coat protein ORF from tomato mosaic tobacovirus from a supposedly 140,000-year-old drill site in Greenland, which differed only by a few percent from extant strains.[37] This raises the obvious question as to how the RNA from this species could remain intact for so long, and it also fails to show any evidence of evolution of this organism over such a supposedly long timespan. Reminiscent of red blood cells isolated from dinosaur bones, active NCLDVs from the permafrost question the long-ages paradigm: can these 'virus' particles retain their infectivity for so long, especially ones the size of NCLDVs with their large genomes intact? Maybe they are not as ancient as evolutionary theory would have it.

There is evidence that the genomes of NCLDVs are also undergoing genome decay, which is the opposite process of gradual evolutionary buildup of genetic information. These genome reduction processes have been observed under laboratory conditions as opposed to unobserved evolutionary speculations. All of these interesting considerations regarding the genomic characteristics of NCLDVs greatly support the creation model and imply that the evolutionary model for the evolution of these species is highly questionable.

The speculation that the hypothetical last common ancestors of all NCLDVs contain 50 common genes has

been refuted, disproving that NCLDVs originate from a single ancestor. It is more likely that NCLDVs have no more than 9 genes in common, and also have independent origins. Furthermore, it would be interesting to analyze any genomic data from NCLDVs to see what kind of groups they cluster to, which could well be the object of future baraminology studies.

## Materials and methods

The data for figure 1 came from Boyer *et al.*[17]. Protein sequences were downloaded from the Uniprot FTP website at: ftp.uniprot.org/pub/databases/uniprot/current_release/knowledgebase/taxonomic_divisions/ for 10 major taxonomic categories: Archaea, Bacteria, Fungi, Human, Invertebrates, Mammals, Plants, Rodents, Vertebrates and Viruses. These sequences represented protein sequences from all other domains of life, 549,215 in total. All 20,086 NCLDV proteins were blasted (blastp) against these protein sequences to see if any of them gave a hit with any other species. A maximum e-score cutoff of 1e-4 was applied.

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# Earth impacts and the faint young sun

*Wayne Spencer*

The 'faint young sun paradox' is considered in relation to theories on the early earth and a new proposal regarding Earth impacts. This proposal is that large impacts could produce greenhouse gases for millions of years that would help solve the problem of the evolution of life under the young sun. The concept dovetails with proposals that large impacts could stimulate volcanism. Problems with this concept are considered in relation to the time-scale of the faint young sun problem. It is shown that the new proposal is overly optimistic regarding impacts affecting greenhouse gases and that the outgassing effects in any case would only be present for a small portion of the time in which the faint young sun issue exists.

The 'faint young sun paradox' continues to be a challenge to evolutionary ideas on the origin of life on Earth. The problem affects approximately the first 2 Ga of our solar system, by evolutionary reckoning. Creationists have frequently addressed the issue.[1–4] Models of the sun suggest that at about 3 Ga before present the sun's luminosity would be approximately 20% less than today. By 2 Ga before present, solar luminosity would be approximately 15% less.[5] The present paper does not address the period from about 2 Ga ago to 3 Ga ago. That period poses different issues than the period prior to 3 Ga ago because evolutionary models postulate significant changes in Earth's atmosphere. Impacts were not a factor in secular theories in the period from 3 or 3.5 Ga ago to the present. The lower solar luminosities from prior to 3 Ga ago have the potential of causing all water on Earth's surface to freeze for some time. Thus the question that arises is how could life evolve? It is generally believed the first life to evolve was some form of microorganism that lived in water, possibly something similar to the cyanobacteria known to exist today. A hypothesis has recently been put forward suggesting that large impacts in the early earth could help resolve the faint young sun problem.[6]

The new proposal relating impacts to the faint young sun problem has been published in *Earth and Planetary Science Letters* (2016) suggesting that in the period between 3.5 and 4.5 Ga ago large impacts could cause outgassing at the earth's surface that would generate a significant greenhouse heating effect and warm the earth.[6] Earth and planetary scientists have applied a number of different proposed greenhouse heating mechanisms in order to make the early earth warm enough for life to evolve and survive. In the 1970s Carl Sagan suggested that Earth's atmosphere once had higher proportions of gases such as methane, ammonia, and carbon dioxide than today.[7] That was largely abandoned because it required unrealistically high concentrations of the greenhouse gases. In the early period of prior to 3 Ga ago scientists have generally taken the view that the early earth's atmosphere was denser than today, making a greenhouse effect more significant. It is thought that heat would come from other processes as well. For example, the hot surface and mantle of the earth would strongly heat the atmosphere for a long period. But what was Earth's atmosphere believed to be like prior to 3 Ga ago?

## The early earth

The earliest history of the earth, by today's evolutionary theories, involves a complex series of atmospheric changes and catastrophic events.[8,9] Sometime between about 50 to 100 Ma after Earth begins to form, a Mars-sized object is believed to have collided with Earth. This ejected material is thought to have formed our moon. The earth's surface was largely molten at the time of the moon-forming impact (allowing the impactor material to mix into Earth's mantle). Before this powerful collision Earth's atmosphere is believed to have been even more dense than Venus's atmosphere is today. It could be argued that the early earth had multiple atmospheres, since it is thought it's first atmosphere was lost due to collisions and after this there were dramatic atmospheric changes due to both impacts and changes in the earth's interior. In the naturalistic concept of the early earth, the atmosphere was of a reducing nature (little or no oxygen) until approximately 2.3 Ga before present.[10,11] By 2.3 Ga ago it is believed there was a dramatic increase in oxygen in the atmosphere. The increase in oxygen levels is believed to have been due to photosynthetic bacteria which lived in liquid water. So evolutionary theories would say the first life must evolve in liquid water when the atmosphere has very little oxygen. It is believed that the surface waters could have had minute concentrations of oxygen (such as in the nanomole range) even if the atmosphere did not.[10] Before the atmosphere changed to having oxygen as it does today, there would have been a long period of perhaps hundreds of millions of years where microorganisms existed. But because of the violent large impacts taking place in Earth's first billion years, scientists now believe that early life could

have evolved multiple times only to be wiped out by the harsh conditions.

Though an early reducing atmosphere has long been accepted in the scientific community, this has never been well supported by geological evidence. Creationist geologist S. Austin pointed out that some arguments used to support an early reducing atmosphere have other plausible explanations.[12] In addition, Austin argued that sedimentary rocks known as 'red beds', which contain the mineral hematite, argue for an oxidizing atmosphere. These red beds are often associated with banded iron formations, which have sometimes been used to argue for a reducing atmosphere. A much more recent report from the *Proceedings of the National Academy of Sciences (PNAS)* gave results of a study of hydrogen and oxygen isotopes in serpentine minerals from the Isua Supracrustal Belt of West Greenland.[13] The samples used in this study would be dated by uniformitarian assumptions at 3.8 Ga. The study concluded that oxygen concentrations in the Archean oceans were comparable to today. The study also considered chemical processes affecting hydrogen, methane production by photolysis, and carbon dioxide. They concluded much hydrogen was likely lost to space and this would limit concentrations of methane. This in turn limits the greenhouse effect from methane. The *PNAS* study concluded with this statement about the faint young sun problem.

> "This supports the argument that the combined greenhouse effect of atmospheric $CO_2$ and $CH_4$ cannot independently reconcile the faint early sun paradox. Additional forcing, such as a lower Earth-albedo, is necessary to maintain temperate conditions in the early Archaean."[13]

The last sentence in the quote refers to a new idea proposed by some, that during the Archean period Earth's oceans covered significantly more of the surface and the overall darker surface of the earth would more efficiently absorb energy from the sun.[14] Thus some have argued from geological evidence that $CO_2$ levels were not enough to allow for liquid water. This sometimes prompts scientists to combine multiple mechanisms.

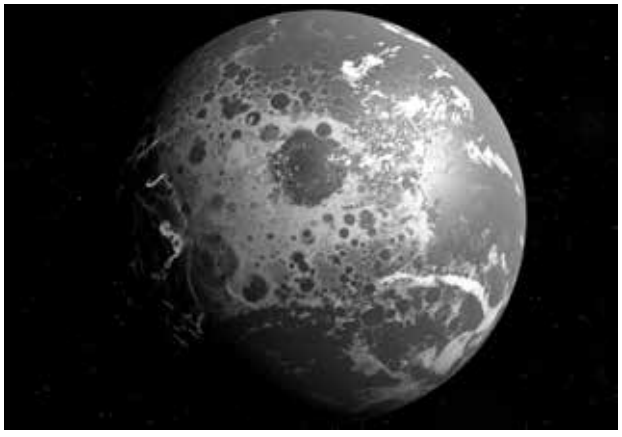

**Figure 1.** Artistic rendering of the early earth in the late Hadean period, approximately 4 Ga ago by uniformitarian assumptions. Earth's surface shows craters, some molten zones, some ice, and some liquid water.

It has been a common view among scientists that the earliest chemical evidence for life on Earth would be dated at approximately 2.3 Ga old. This comes from discoveries of organic chemicals classed as hopanes and steranes in certain drill cores of Precambrian rocks.[10] But a recent publication now questions this evidence on the basis that such chemicals could be introduced by contamination, even in the more carefully collected samples.[15] Even if there were chemical evidence of life in rocks 2.3 Ga in age, in order to leave this evidence, life would presumably have to exist long before this time. There are also reports of evidence of life prior to 3 Ga ago, such as stromatolites dated at 3.7 Ga ago, suggesting microbial life.[16] It is generally accepted by the scientific community that it was primarily photosynthetic bacteria, which generated most of the oxygen in Earth's atmosphere. This implies that these bacteria had to survive for well over 1 Ga before Earth's atmosphere became oxidizing. The oxygen producing bacteria had to thrive enough so that oxygen would build up to significant concentrations in the atmosphere. So, this implies the faint young sun paradox is a problem that lasts for more than a billion years, since it is still a problem after 2 Ga ago. There continues to be debate about how oxygen-producing bacteria could cause Earth's allegedly thick early atmosphere to switch from a reducing character to having a significant fraction of free oxygen. This is the background for the recent paper by Marchi *et al.* (2016)[6] which proposes that large impacts generated a greenhouse effect in the early earth that kept surface waters from freezing. The period this new idea applies to is after the moon-forming impact and up to approximately 3.5 Ga ago.

The paper by Marchi *et al*. proposes that some large impacts would cause melting of the mantle under the impact site that would lead to millions of years of outgassing from molten material on Earth's surface. The impacts proposed for this are larger than any known identifiable crater sites on Earth today. The largest known impact sites on Earth today, such as Vredforte in South Africa,[17] would be too small to have the intended effect. Another paper by Marchi in 2014 summarized the large impacts in the following way.[18] The number of impactor objects striking the earth larger than 100 km diameter would be in the range of 100 to 150. Impactors of this size would create craters possibly several hundred kilometres in diameter on the earth. The number of impactors larger than 200 km diameter would be from 10 to 30. The paper by Marchi from 2014 also advocates impact-induced melting of material in the mantle and lithosphere that would bring large volumes of lava to the earth's surface.

## Effects of impacts

What would be the effects of such impacts? It has been proposed by some that for impacts of this scale there could be melted rock that is much more in volume than that produced by the impact itself. There have been a number of studies simulating the effects of impacts in the early earth. Much attention has been given to estimating the amount of impact melt produced in the crater floor. The impact melt liquefies because it has been shocked and when the extreme pressure releases it leads to the rock melting. Some scientists have proposed a new mechanism in which large impacts could release large quantities of lava for extended periods of hundreds of millions of years. It is argued that a large impact can reduce the pressure on the magma under the crater site enough to cause melting that starts a mantle convection under the crater site. The higher temperatures of the mantle in the early earth are believed to make this more feasible than it would be today. This implies that the crater itself would likely be obliterated by the melted rock that comes from below. Because these would be large craters it is believed a large volume of molten material could come to the surface. The large pool of molten material would stay on the surface for a long period of time, due to being fed by a mantle convection below it. This molten pool would be associated with volcanism at or near the impact site and gases would evaporate from it into the atmosphere. The gases believed to be involved would be carbon dioxide, carbon monoxide, sulfur dioxide, hydrogen sulfide, as well as some methane, hydrogen, and water vapour.

This impact-induced greenhouse concept makes two major assumptions. First, that large impactors would continue striking Earth with some frequency long after the moon-forming impact, and second that impacts can cause volcanism. The Late Heavy Bombardment is believed to have taken place from approximately 4.2 to 3.8 Ga before present, based on lunar crater data. At about 3.85 Ga planetary scientists generally agree that the rate of cratering dramatically decreased.[19] This raises questions about what the realistic time-frame of effects for these impacts would be. According to theories on the early earth, large impacts were frequent from 4.5 to 3.9 Ga ago. This period included impacts of sufficient scale that it's believed they would have more than penetrated Earth's crust and lithosphere. It is also thought that some of these impacts could have completely vapourized all water on Earth's surface. This kind of vapourizing of surface materials would make the atmosphere temporarily very dense but the water and some other material would cool and make its way back to the surface. Even for the moon-forming impact it is suggested that the hot dense material in the atmosphere would largely cool in a period of roughly 1,000 years.[8] One impact could have covered over or overturned another, as crater structures were broken up and impact melt filled craters. Large volumes of molten rock are believed to have filled the largest craters and possibly melted the earliest crystalline minerals and zircon crystals. However, there seems to be no large impact basins known on Earth today in which lava totally filled the crater (like the lunar mare), but it is believed this was common in Earth's first billion years. The research on large impacts on the early earth generally does not include changes in the earth's atmosphere along with effects on Earth's surface and in the mantle. Thus there is much uncertainty on the atmospheric effects in the early earth environment.

## Volcanism and impacts

The direct effects of the large impacts above would not last tens or hundreds of millions of years, so this new idea attempts to lengthen the time of the effects by building on controversial ideas that impacts can cause large scale volcanism. This hypothesis suggests that when a large crater is created by an impact, it depressurizes the lithosphere and mantle enough so as to significantly increase the amount of molten material under the crust and lithosphere. By setting off a convection cell in the mantle under the crater site, it is believed that melt can make its way to the surface and cause a large volume of gases to be input into the atmosphere. This concept also goes hand-in-hand with a view that large igneous provinces on Earth (such as the Deccan Traps for example) could come from impacts. I believe that the connection between such large basalt deposits and impacts is questionable. Melosh and Ivanov have argued from their impact physics simulations that large impacts on this scale cannot generate melted rock in the manner suggested.[20]

On the other hand, there are scientists who persist in the view that large basalt deposits could be related to impacts due to the depressurization of the mantle as mentioned above. Even if some volcanism happened at a crater site, it seems unlikely it could last for hundreds of millions of years. In the recent paper by Marchi *et al.* (2016),[6] they summarize their results for atmospheric carbon dioxide this way:

> "These simulations show that impact outgassing could have intermittently sustained a level of atmospheric $CO_2$ above the inferred minimum condition for liquid water in the early Archean and Hadean … for a cumulative time span of several 10 Myr up to 100 Myr."

The assumption of it lasting this long may come from the assumed volume of molten material and the time required for it to cool. But does it really require tens of millions of years for such a volume of molten material to cool? Water and volatiles present could actually hasten the cooling. Thus, even if some gases were released into the atmosphere, its actual effect on atmospheric temperatures could be

relatively short-lived. If Melosh and Ivanov are correct, the depressurization mechanism above would not be effective in generating large volumes of melt. Impacts can have more direct atmospheric effects but they are not long-lived. Thus the depressurization concept has arisen in order to provide a mechanism for a long-term heating and now an outgassing effect at Earth's surface.

There continues to be research by geologists and geophysicists that looks for evidence connecting large basalt deposits with possible impact structures. But this is in sites where there is little or no clear indication of a large crater. On the moon there are abundant indications of volcanism in and near craters but on the moon this is mainly in the form of dikes. The thinner crust of the moon, especially on the near side, makes volcanic dikes possible within craters where some of the crust has been removed and lava came up through fractures. There is also some evidence on the moon that impacts sometimes apparently overturned or excavated basalt rocks from earlier impacts. Thus there may have been essentially multiple generations of mare on the moon.[21] The hypothesized earlier mare rock that were destroyed by later impacts are referred to as cryptomare. The same could be possible on Earth if an impact were large enough. But molten material (or geothermal fluids) coming up through fractures is a different process than this new concept proposed by Marchi *et al.* Molten material coming to the surface via fractures or dikes in a crater also would not be a long-lived process that would continue for tens of millions of years.

From what is best known about the atmospheric effects of impacts, impacts would not normally have a long-term effect on the atmospheric temperature. Most of the ejecta in an impact is in the form of dust and particulates; gases released by impacts are normally very minor. On the other hand, volcanic eruptions often release gases such as sulfur monoxide, carbon monoxide, methane, and other gases that can form hazes in the atmosphere. These hazes can require a few years to clear from the atmosphere, after a volcanic eruption. There are some other short-lived atmospheric effects of impacts but they could not cause long term changes for millions of years. Sometimes acid rain can be produced in the region near an impact, due to the formation of nitric acid in the atmospheric wake of the impactor. Large impacts can also actually cause some of the atmosphere to escape into space. A partial vacuum is created behind an impactor as it ploughs through the atmosphere and this can essentially suck gases into space. So if large impacts caused outgassing, the greenhouse effect might be counteracted to some degree by an atmospheric loss from the impacts.

## Life on the early earth

Life is thought to have started on the earth in the period between 3 and 4 Ga ago. Only as impacts became less frequent could there be some areas of Earth's surface where life might have survived. Thus it is thought the earliest life forms would have to be bacteria that could survive in relatively high-temperature waters (prior to 3 Ga). Today scientists have come to a view of the early earth in which Earth is very hot for a long time. This view is mainly a consequence of planetary science considerations on Earth's formation, not from geological evidence. But after the Late Heavy Bombardment ended at approximately 3.8 Ga ago, it is thought Earth's surface would cool. Thus it is in the period between approximately 4.0 and 3 Ga ago that the faint young sun could freeze Earth's surface. It is also believed there would also be much outgassing from the earth's interior from volcanism that would be totally unrelated to impacts. Theories on the early earth generally agree that an outgassed atmosphere would be a reducing atmosphere, not an atmosphere with significant oxygen. Impacts in the early earth thus serve the purpose of thoroughly mixing Earth's rocks and minerals. The early earth is also 'kept hot' in scientific models in order to counteract the early faint sun problem. Yet it is not clear how the atmospheric changes would unfold. Thus a self-consistent early history of the earth from 4 Ga to 2 Ga has not really been worked out by secular scientists.

Tidal heating of the earth, radioactive decay, intense ultraviolet radiation from the sun, and other mechanisms have been considered as solutions to the faint young sun problem. Even at best, none of the mechanisms proposed to keep the earth's surface warm would last for more than a small portion of the 2 Ga of time from 4 Ga to 2 Ga ago. Evidence sometimes conflicts from a secular perspective. For example, some studies have implied that Earth's atmospheric pressure could have been lower than present, perhaps as low as half current pressures.[22,23] One of these studies was looking at nitrogen and argon isotope data believed to be from 3.5 to 3 Ga ago.[23] The other was regarding fossil raindrop evidence believed to be from 2.7 Ga ago.[22] If the atmospheric pressure was less, this tends to make the faint young sun cooling problem worse, but researchers tend to propose a higher proportion of greenhouse gases to warm Earth's surface. This shows how one type of evidence can conflict with another type of evidence. However, from a creation perspective with a young earth, many of the difficulties disappear in a biblical view of Earth history.

## Conclusions

Impacts do not solve the early faint sun problem prior to 3 Ga ago in secular scientific models. Firstly, it is not clear that the outgassing mechanism proposed by Marchi *et al.* would be effective in altering Earth's surface temperatures. Serious doubts have been raised for the depressurization mechanism

for outgassing from impact sites. The relationship between large impacts and volcanism continues to be debated in the scientific community. But a clear case has not really been made from geological evidence, for known sites on Earth where a crater structure can be causally related to volcanism. Certain sites have been proposed to be caused by an impact, such as the Deccan Traps region in India. But arguing a causal connection between the impact and the volcanism is very difficult. It seems to be simply assumed by those that advocate the concept, mostly on the basis of the assumed coincidence in time between the impact and the volcanic activity.

Secondly, any conceivable atmospheric effects of impacts, even very large ones, could not be expected to endure for adequately long periods of time. This is the case even if one grants the outgassing mechanism proposed by Marchi *et al.*[6] In their own conclusions their proposal would only warm Earth's surface temperatures for approximately 100 Ma at most, per large impact, as quoted above. The early faint sun problem applies to an evolutionary Earth history for about one or one and half billion years, during which Earth's surface could be very cold. So even if an impact could warm temperatures for a time, life would not evolve. Life would not evolve because liquid water is considered necessary for the formation of early microorganisms. The proposed period in which the impacts allegedly led to outgassing is from 4.5 to 3.5 Ga ago. For most of this period, when the impacts could have more of an outgassing effect, the effects of the impacts would be too severe for life to get started on the surface, even if the outgassing mechanism proposed were viable. The possible time window when life could start in this scenario would be from about 3.8 to 3 Ga. But this is also enough time for the effects of the impacts and volcanism to subside and the surface of the earth to freeze. If the impacts slow, so that life could have opportunity to establish itself, then the impact 'solution' to overcome the problem of the cold temperatures of the early faint sun is no longer effective. Thus, whenever the impacts end, the early faint sun problem returns. Even if the impacts and volcanism kept Earth's atmosphere and surface warm enough for liquid water until 3 Ga, there would still be hundreds of millions of years in which Earth's surface waters could freeze after the impacts ended. Thus a frozen surface of the earth makes the evolution of life even less likely. This illustrates the complications introduced by old age uniformitarian assumptions. Instead, we should accept that God created Earth only several thousand years ago and that Earth was made well-suited to life from the beginning. If the sun and Earth are both part of a young solar system which was designed to allow for life from the beginning, the faint young sun problem disappears.

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# Where was Eden? part 2: geological considerations—examining pre-Flood geographical details in the biblical record

*Robert Carter and Lita Cosner*

Part 1 of this article discussed the textual and geographic evidence that one must use to attempt to locate Eden, the garden, and the associated rivers described in Genesis 2. We concluded that there is no textual reason to assume it can be located on any modern landscape and that no geographical candidates exist that fit the given data. In the second part of this article we will analyze several critical geological features of heavily eroded surfaces that further confirm the idea that Eden cannot be placed on the contemporary surface of the earth.

Munday, while attempting to build a case against the biblical, global Flood, correctly argues that young-earth creationists who claim that Noah's Flood wiped out the antediluvian landscape attribute much more destructive force to the Flood than other interpreters (like Calvin) throughout church history.[1] However, geology was not a science during Calvin's time, and since then we have found that there are multiple kilometres of sedimentary strata beneath the most commonly proposed location of Eden. Carol Hill expresses the problem well:

> "But modern geological study has shown (by oil drilling) that the landscape of southern Iraq is underlain by six miles [10 km] of sedimentary rock. Thus the question can be asked: How could the Garden of Eden, which existed on a pre-flood landscape existing *before* the flood, have been located *over* six miles of sedimentary rock created *during* the flood?"[2]

This is a serious consideration, and anyone who attempts to search for Eden on a modern map must take this into account. Would the topographic features described in Genesis 2 be visible after potential scouring at the onset of the Flood, massive deposition of sediments in the early stages of the Flood, and further massive erosion of sediments during the recessional stage of the Flood? When thinking about what would be required to find Eden after all this potential geological change, the *Princess and the Pea* fairy tale comes into mind: each layer of geological change creates one more barrier to the detection of the original land surface. Add to this the creationist model of Catastrophic Plate Tectonics[3] and we cannot know how much Eden moved during the Flood or even if the location still exists, as it may have been subducted.

Secular plate tectonic theory claims the Persian Gulf is a former rift zone that reversed at some point in the past. According to this theory, the Arabian Plate is currently colliding with the Eurasian Plate, creating the Iranian mountains.[4] The tectonic setting of this region is complex, but if we accept the relative order of the events given to us by secular geologists, we might be forced to conclude that the Persian Gulf did not exist prior to the Flood. This would cause us to further question the Mesopotamian Eden hypothesis. Where did the antediluvian Tigris and Euphrates flow *to* if there was no Persian Gulf?

Clearly there are major geological considerations that impinge upon the search for Eden. But there are historical changes to the landscape that must also be taken into consideration. Pliny claimed the two main rivers in the area (the Tigris and Euphrates) emptied into a common lake during the time of Alexander the Great (who died in 323 BC),[5] and they may have had separate mouths earlier in the historical period (figure 1). Cooke also points out that a town Alexander founded 2.4 km from the shore (c. 320 BC) was approximately 193 km inland by the time of Pliny (c. AD 70).[6] This town, Charax, was located near the confluence of the Tigris and Karun rivers, yet the shoreline penetrated further inland at that time (see figure 5 in Cooke[6]), eclipsing nearly all the region designated by Beitzel[7] as the possible southern location for Eden (Beitzel's map is presented in part 1 of this paper). There are multiple references in ancient history to Ur being on the *shore*,[8,9] which would put the most ancient references to the extent of the Persian Gulf several hundred kilometres inland of the current shoreline and well above the modern confluence of the two rivers. Cooke argues that the early civilizations at Sumer and Susa, both located well inland of the modern shore, were separated by water, because the shoreline at that time was far inland. All this reveals a topological trap for modern people, one into which many professional and amateur historians and theologians have fallen: one cannot simply put their finger on the modern

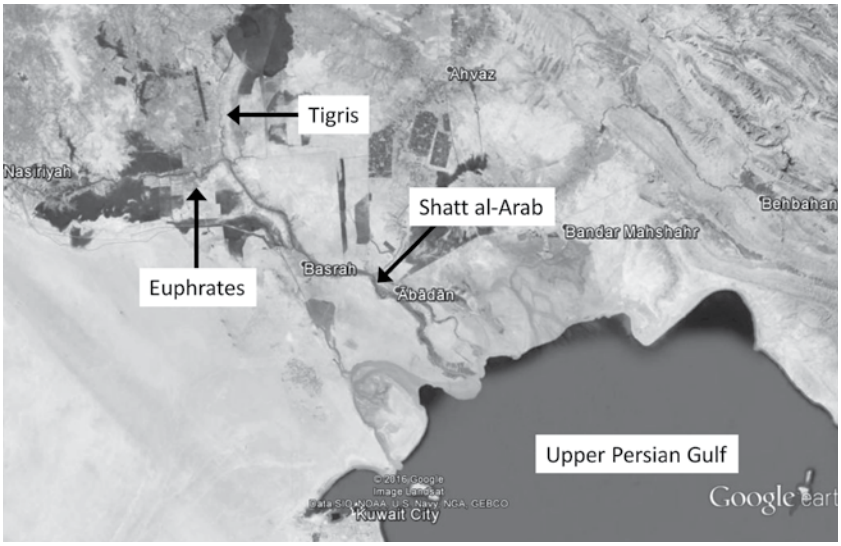


**Figure 1.** GoogleEarth® image showing the modern confluence of the Tigris and Euphrates rivers above Basrah, Iraq. The two rivers join to become the Shatt al-Arab waterway. Also seen in the image is an older Euphrates river outlet along the shoreline to the south-west and extensive shallow marshes to the north-east that include three defunct outlets for the Karun river, which flows in from Iran (to north and east) and joins the Tigris above the Shatt al-Arab. Siltation over thousands of years has continuously changed the shoreline in this region. Image view is approximately 450 x 250 km.

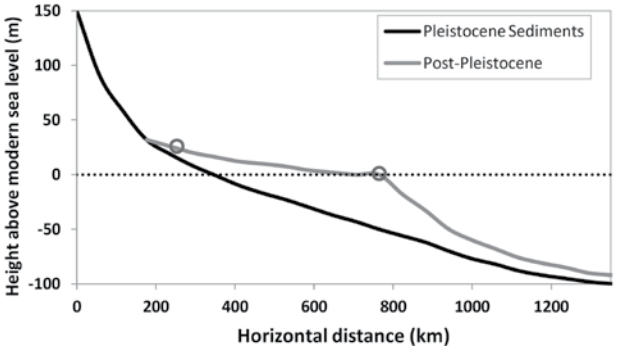


**Figure 2.** Topography of the Persian Gulf region from about 220 km north-west of Bagdad to about 600 km out into the Gulf (after Cooke[6]). The two circles represent the locations of Bagdad (left) and Fao (right), which sits at sea level. A massive wedge of erosional sediments has built up during the post-Flood, historical period, contributing to significant changes in the shoreline.

shoreline and then extrapolate history into the ancient past, for the shoreline in many places in the world will move considerably over the historical period.

Because of its low-lying topography, most of Mesopotamia would have been underwater right after the Flood. Initially, ocean levels would have been perhaps 60 m higher than present.[10] Sea level was approximately 120 m below present during the height of the Ice Age,[11] then rebounded to current levels early in the historical period. Deposition of sediment would have occurred the whole time, meaning the ingressive and regressive shoreline would have happened over different underwater topography and the changes could have been rapid. There currently exists a deep wedge of erosional sediments trending out into the Gulf and sitting on top of Pleistocene-age sedimentary rocks (figure 2). Even for those creationists who hold a 'high' Flood/post-Flood boundary, placing it in the 'late Cenozoic',[12] all parties should agree that this material is post-Flood. Clearly, sediments have continually been deposited throughout the historical period and have made significant changes to the shoreline. Archaeologists are currently using satellite and sediment core data to better understand the complex shoreline history of this region. If the rivers were not connected when Genesis 2 was written, one of the major assumptions behind the majority of work on this subject (that Eden was in lower Mesopotamia) is nullified.

## Erosion vs creation

First and foremost, the antediluvian world was not shaped by erosion. True, the land emerged from the ocean on the third day of creation (Gen 1:9–10), but then God immediately created plants (Gen 1:11–13), thus stabilizing the ground and preventing the massive wasting erosion that would have ensued along any significant soil slopes upon exposure to water (subterranean or otherwise). When Genesis describes the land, we should not forget that the original creation is expected to be different from the modern world. The primary shaping force on the post-Flood world, however, *is* erosion (figure 3). Thus, due to the physical constraints placed upon us by biblical history it might be a fool's errand to attempt to match the geographic references to the Garden of Eden and its environs with modern topography.

The implications of the modern erosional surface are profound. First and foremost, the most direct implication is that the modern and antediluvian landforms are simply not comparable. For example, in today's world there are no examples of even two major rivers originating at the same lake or spring, but Genesis 2 has *four* major rivers originating from the same source. Multiple identical river sources is a physical requirement from the text, but is also impossible to generate from erosional surfaces. Even if it were possible to set up such a system, the lowermost

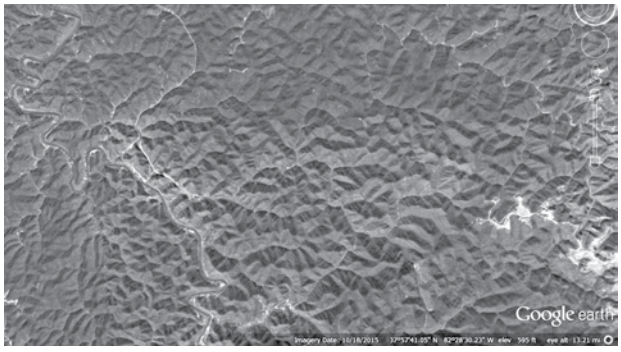


**Figure 3.** GoogleEarth® image showing classic erosional patterns on the Appalachian Plateau between Stonecoal and Wilsondale, West Virginia (USA). In many places on Earth, multiple kilometres of erosion or deposition have occurred. The entire modern surface of the earth has been shaped in some fashion by erosional processes. This was not true of the antediluvian world. View is approximately 23 x 13 km.

or fastest eroding outlet of any drainage area will always dominate and eventually take over.

## Tigris and Euphrates not connected at either end

When people attempt to correlate the modern Tigris and Euphrates to the situation in Genesis 2, they generally fall into one of two topological traps. It is true that the source of the Tigris (Lake Hazar in south-east Turkey) is separated from the Euphrates only by a low saddle of land (figure 4). From a mapping perspective, with a view high above the earth, it appears that the two are quite close to one another. Yet, the *source* of the Tigris and the *source* of the Euphrates are not at all close. In fact, the two river basins represent a simple fact of topography: water does not flow uphill and any two river basins will have close contact with other river basins all along their respective edges.

Not only do the Tigris and Euphrates not connect at the source, no other major rivers do either. The source of the Araxes river lies between the two main arms of the upper Euphrates, and other rivers in the area form and flow downhill into the Black Sea or Caspian Sea, but they all follow the same general rules for erosional surfaces described above. Thus, and despite much speculation on the subject by multiple authors, an Armenian location for Eden is precluded by the geography of the area.

Note that Genesis also says that the four rivers *start* in the same place, whereas the Tigris and Euphrates merge just before they reach the Persian Gulf. But, as we explained above, in ancient times they each had their own mouth, meaning they merged after people started living in the land and the appearance of connectivity is modern. The two rivers were historically not connected at *either* end.

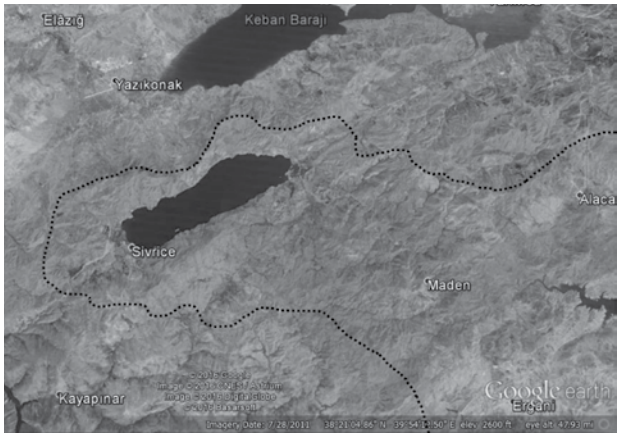


**Figure 4.** GoogleEarth® image showing the upper Tigris drainage basin (approximately within the black dotted line). The modern Tigris river starts in Lake Hazar (centre) in south-east Turkey. It drains to the east. To the north, west, and south is the Euphrates drainage basin, including the lake at top and the river to the south-west. While the two rivers do get close to one another, note that the sources of the two rivers are not near one another. In fact, the source(s) of the Euphrates are to the north of the area represented in the image. View is approximately 80 x 40 km.

## Rhine and Danube drainage basins are an almost-exact match

The situation with the source of the Tigris and Euphrates is not unusual, for every major river drainage basin is separated from others by a simple change in slope. For example, even though they are connected underground through the porous limestone basement rocks (and later via a canal), the source of the Danube in Germany's Black Forest and the Rhine present an amazingly similar picture to that of the Tigris and Euphrates (figure 5). The headwaters of the Danube are basically surrounded by the Rhine drainage basin. Yet, nobody would ever claim they have the same source. The only reason people muddle these claims for the Tigris and Euphrates is that they are desperately searching for a correlation between ancient writing and modern topography, and this correlation does not exist.

## Extra-biblical evidence

While of course the biblical evidence has primacy, there are a few extra-biblical references one can examine. Specifically, references to a mountain in or near the Garden of Eden can also be found outside the Bible. For example, several scholars have made the case that the most ancient form of Chinese writing contains pictographs that hearken back to the biblical accounts of the Creation and the Fall,[13] Noah's Ark and the Flood,[14] and the "lamb of God".[15] Consider the series of symbols from Nelson and Broadberry's *Genesis and the Mystery Confucius Couldn't Solve* and see how they combine to produce the symbol

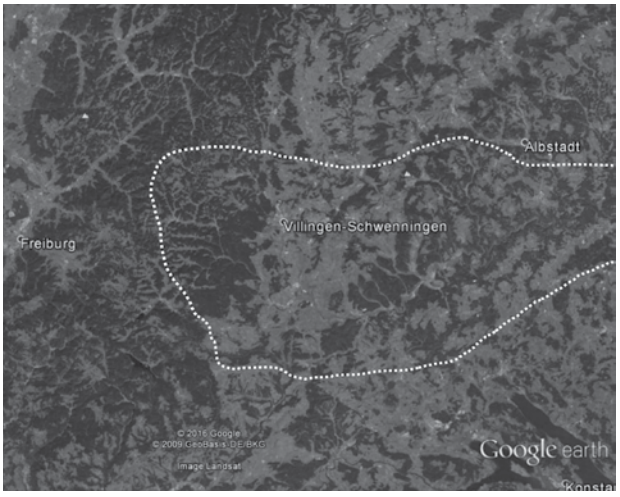


**Figure 5.** GoogleEarth® image showing the upper Danube drainage basin (approximately within the white dotted line) in Germany's Black Forest. To the north, west, and south is the drainage basin for the Rhine. These two rivers drain a large portion of central Europe. The Danube flows to the east, eventually reaching the Black Sea. The Rhine drains to the north and west, reaching the Atlantic at Rotterdam. These two rivers directly parallel the Tigris and Euphrates situation. View is approximately 80 x 40 km.

for 'garden' (figure 6).[16] Note the 'God' figure standing on a 'mountain' overlooking two people within a bordered enclosure, and note that the mountain stands out prominently.

We must also consider the ubiquitous shape of early religious buildings, from Mesopotamian ziggurats to Egyptian and Mesoamerican pyramids. The idea that a 'god' was associated with a high mountain is almost ubiquitous among ancient peoples, to the point where they built artificial mountains far from any heights as places of worship. Real mountains are also traditional 'holy' places. This is quite conjectural, but still worth discussing. Why did so many early cultures associate mountain heights with the presence of their god(s)?

## Biblical evidence

Since the single river coming out of Eden breaks up into *four* rivers, we know that Eden must be higher than the surrounding region, perhaps much higher. There is etymological evidence for this. As we demonstrated in part 1 of this paper, the name of the river Pishon (פישון) means 'bubbling' and Gihon (גיחון) means 'bursting forth, gushing'.[17] Thus the river names themselves may reveal that some significant drop in elevation occurs from the source to the outlet of the rivers. They are certainly not 'lazy' rivers.

Interestingly, a mountain is associated with Eden in several biblical references. These are not definitive, but they are worth studying. In the middle of a lament over the king of Tyre, which is also full of references to Eden and allusions to Satan, Ezekiel 28:14–16 says:

> "You were an anointed guardian cherub. I placed you; you were on the holy mountain of God; in the midst of the stones of fire you walked … . I cast you as a profane thing from the mountain of God, and I destroyed [or banished] you, O guardian cherub, from the midst of the stones of fire."

Putting aside a discussion of the 'stones of fire', the Edenic imagery that surrounds this passage is clear, and so is the mention of the mountain.

Revelation also talks about a mountain in an Edenic context. Right before the Genesis themes of the "curse" (22:3) and "the tree of life" (22:2, 19) appear, John says:

> "And he carried me away in the Spirit to a great, high mountain, and showed me the holy city Jerusalem coming down out of heaven from God (21:10)."

Like the extra-biblical references to a mountain in Eden, this biblical reference is speculative, one might even say weak; however we decided to include it for the sake of completeness. Here again is a mountain associated with Eden-like themes with the New Jerusalem coming down next to that mountain.

Does all this mean there actually was a mountain in the Garden of Eden? No, and it is admittedly speculative, but it does *support* the idea that a mountain was in Eden, within or near the garden. Either way, combing the references to rushing or bubbling water in two of the four rivers, the fact that rivers must flow downhill, and the tangential references to a mountain in an Edenic context indicates that the garden was at some elevation. Why do we reference all of this circumstantial material? Because it almost certainly precludes a Mesopotamian location for the garden. Lower Mesopotamia, especially, is nothing more than a flat, alluvial plain.

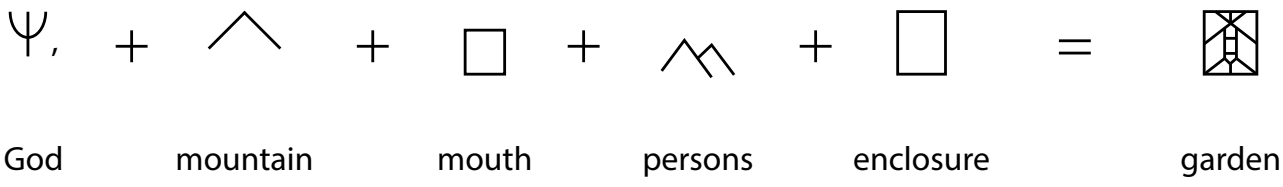


**Figure 6.** Of the several pictograms that mean 'garden' in the most ancient Chinese script, this one has a mountain standing prominently within it (after Nelson and Broadberry[16]).

## A model of Eden

There are many possible layouts that include the necessary elements of 1) A garden in a larger area called 'Eden'; 2) A relative elevation for the source of the river, which flows through Eden before splitting into four rivers; and 3) an eastward progression of features (which is an assumption based on the overall implications from Genesis 2–4).

What is clear, however, is that no modern-day candidate for the location of Eden possesses characteristics resembling this rough schematic. Thus any proponents of modern locations of Eden have to ignore elements of the text which describe elements not present on the modern globe. Not only that, but such proponents are forced to downplay the plain meaning of the Genesis text, to the point where the geographic data given in the text become nearly meaningless. Focusing on just a few of the terms used is insufficient when one must jettison the remaining terms. This is especially important after one realizes that most of the geographic terms are either very common words (and are thus so generic as to be irrelevant in the search for Eden) or are named after *post*-Flood people (and thus cannot legitimately be used in the search for Eden).[17]

## Conclusions

Part 1 of this paper established that there are no textual or geographical reasons to expect Eden can be located on a modern-day map. Here we establish multiple geological reasons to also conclude that Eden should not be able to be located in the modern world. The modern landscape is shaped by Flood erosion and post-Flood geological activity, which would have obliterated Eden if it were on or near the surface. Also the majority of the continental surfaces have kilometres of sedimentary rock deposited by the Flood. If the sediments can be attributed to Flood deposition, the original Eden is buried deep. One must also examine the fact that sediments are always deposited in slack-flow areas, and that these are almost always in basins (as opposed to topographical high points). Thus, the majority of the modern continental surfaces were either low points prior to the Flood, were dropped below the ocean crust during the Flood, or the oceanic crust was almost totally resurfaced late in the Flood to remove the Flood-deposited sediments. Why would anyone expect Eden to be near the surface in *any* of these scenarios?

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