



QUARTERLY

Volume 60 Winter 2024 Number 3

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PART II. ORIGIN THEORIES**
- **THE CLAY CONSOLIDATION PROBLEM AND ITS IMPLICATIONS
FOR FLOOD GEOLOGY**
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Haec Credimus

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

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CRSQeditor@creationresearch.org or to
Tim Clarey, 1806 Royal Lane, Dallas, TX 75229.

Send book reviews to the Book Review Editor:
Mary Beth De Repentigny, Book Review Editor,
marybeth4@gmail.com.

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The Clay Consolidation Problem and Its Implications for Flood Geology Models

Scott L. Dunn*

Abstract

The cornerstone assumption of all Flood Geology models is that rocks can form quickly (i.e., within the timeframe of months to years). However, to date, only isolated examples from the field have been used to support the hypothesis without any quantitative justification. This paper therefore presents the theoretical basis (originally set out by Terzaghi, 1922) for determining the timescales for the first phase of lithification, the mechanical compaction of the sediment under its self-weight (otherwise known as consolidation). The paper demonstrates that when basic soil mechanics theory is applied to the consolidation of thick clay layers of the order of 1,000 m such as those found in the North Sea, Gulf of Mexico, and the Caspian Sea, the timescales predicted for compaction are orders of magnitude greater than is currently assumed. Additionally, it is shown that there is a physical limit to the rate at which sediment can accumulate without creating excessive pore pressure and inducing geotechnical failures. For clay, this limit is approximately 0.1 m/yr, and, for silt, approximately 10 m/yr.

Key Words: clay, consolidation, lithification, pore pressure, sand, shear strength, silt

Introduction

Over the last sixty years since the publishing of *The Genesis Flood: The Biblical Record and Its Scientific Implications* by Whitcomb and Morris (1961), numerous models have been proposed for how the Flood of Genesis, Chapters 6 to 8, may have been responsible for

the presence of sedimentary rock layers around the world. These models have attempted to explain the formation of features such as the Grand Canyon, continental shelves, and the large volume of sedimentary rocks found on the continents. However, to date, it appears that no study has ever been carried out

to quantify the timescales involved in the processes that cause the lithification of the sediment or to show that they are possible within relatively short geological timescales (i.e., within tens to hundreds of years).

Klevberg and Oard (2023) have recently highlighted the lack of quantitative models present in the Flood-Geology literature. They rightly point out that “there is a need to develop an effective model of sedimentary lithification to be used in a Flood model. To be useful, a lithification model must be more than speculation about natural

* Dr. Scott L. Dunn, Senior Technical Director, Jacobs, UK, sdunn74@yahoo.co.uk
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history; it must be as quantitative and empirical as possible.” Although their paper provides very helpful descriptions of the processes involved in lithification, it does not provide the equations required to quantify the timescales involved. It is also focussed primarily on the processes relating to the lithification of sand rather than clay which is known to involve much longer timescales.

Field examples of rapid, sedimentary rock formation are usually limited to unique field environments. For example, the formation of beachrock which is typically 0.5 m to 2 m in thickness can form within months. However, it is only found on beaches with specific ranges of sand size, tidal range, wave climates, and water temperatures (Vousdoukas et al., 2007). It is also only found in a limited area in the inter-tidal zone. Similarly weak rock formations can form rapidly during pyroclastic flows from volcanic eruptions as observed in the 1980 Mt. St. Helens eruption. However, the conditions within pyroclastic flows involve very high temperature ($>300^{\circ}\text{C}$) and are almost entirely dry (water vapor content

less than a few percent). In both these cases it is difficult to see how either of these examples are transferrable to the normal processes of lithification in marine deposits that make up the majority of the sedimentary layers.

This paper therefore attempts to present the framework for assessing the consolidation of clay under self-weight which is generally accepted to occur prior to any significant cementation. Although the focus is on clay due to its extremely slow drainage characteristics, the equations are valid for all sediments from sands to clays. The theory is drawn from basic soil mechanics which has been applied for over one hundred years in the engineering community and is commonly used for the design of dam, bridge, road and building foundation design.

Description of the Mechanisms for the Consolidation of Clay

When cohesive sediment falls out of suspension, it flocculates and deposits in

an almost fluid-like state. It then slowly dewateres until it reaches a concentration where it behaves more like a soil than a fluid. This point is sometimes known as the gel point. In simple terms this is the transition from a mud to a clay and could be taken as the starting point of the consolidation phase where the material would be classified as having soil-like behavior.

At this point, when the gel point is reached and soil behavior commences, the clay is still extremely soft (consistency of toothpaste) and has a very high-water content compared to solid content. It is common for very soft clays to have porosities (i.e., the ratio between the volume of the voids to the total volume) in excess of 0.9. That means that more than 90% of the volume is comprised of voids filled with water and only 10% are clay particles. Typically, cementation in clay only occurs once the porosity is less than approximately 0.4 to 0.5. This highlights the enormous volume of water that must be expelled from the clay prior to cementation.

As an example, a 10 m deposit of very soft clay with a porosity of 0.9 would need to compact to a thickness of 2 m to have a porosity of 0.5 ($2\text{ m} = 10\text{ m} * (1-0.9)/(1-0.5)$). Once cementation begins additional compaction can occur giving rise to further reduction in the layer thickness. For example, it is not uncommon for claystones to have porosities of less than 0.25. This would give rise to a thickness of 1.33 m. Therefore, 10 m of freshly deposited soft clay is required to form 1.33 m of claystone.

Consolidation of cohesive sediments has been an area of extensive geotechnical research for over 100 years. Figure 1 shows the basic principles of consolidation where the soil matrix is modeled as a spring and the pore water must escape in order for the spring to compress. The initial load is transferred directly to the water generating excess pore pressure (i.e., greater than hydrostatic pressure). This high pore pressure then begins

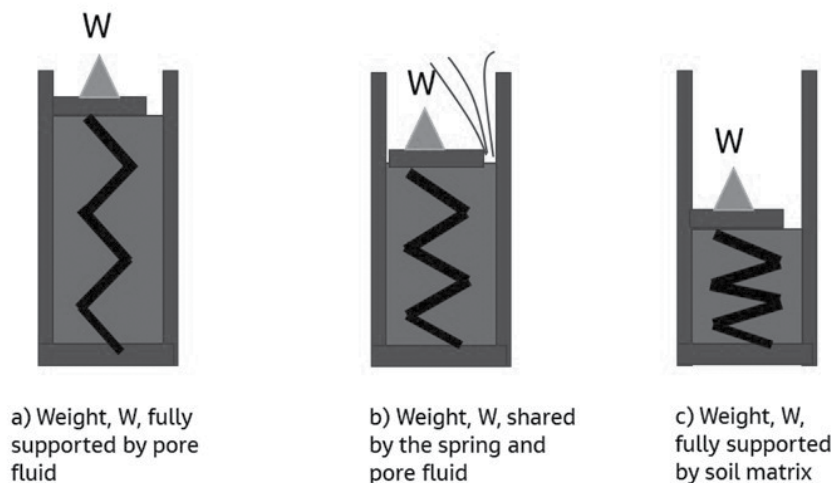


Figure 1. Three stages of consolidation: a) Initial loading where the load is transferred directly to the fluid (no load in the soil spring); b) load transfers from the fluid to the soil spring as water escapes; c) End of consolidation when all the load is now carried by the spring and no flow of water out of the soil

to squeeze water out of the soil at a rate controlled by the permeability (or hydraulic conductivity) of the soil. As the water volume reduces the load is transferred to the soil and it begins to compact.

Simple Analytical Solution of Consolidation Process (Terzaghi's Principle)

The principles for calculating the rate of consolidation of soil were first developed in the 1920s by Terzaghi (Terzaghi, 1922). These were initially based on assumptions of relatively small settlements (infinitesimal strains) but have proved to be adequate for most engineering problems and are still in use today. For cases where the consolidation is substantial (e.g., the consolidation of tailings dam soils), more detailed numerical methods are required (as described in the following section). However, the general principals of consolidation are well described by Terzaghi's equations set out below.

The governing equation that relates the dissipation of the excess pore pressure (U , kPa) to the coefficient of consolidation, c_v (m^2/s) is given by:

$$\frac{\partial U}{\partial t} = c_v \frac{\partial^2 U}{\partial z^2} \quad (1)$$

$$\text{where } c_v = \frac{K}{m_v \gamma_w} \quad (2)$$

m_v is the coefficient of volume compressibility and has units in m^2/N and is a measure of how compressible the material is for a given load. Here low values of m_v represent a "soft" soil which has a higher potential for compression. The hydraulic conductivity, K (m/s), is a measure of the permeability of the soil where low values (such as in clays) results in smaller rates of pore pressure dissipation and hence longer periods for

Table I. Typical range of hydraulic conductivity, K , for different soil types (from Freeze and Cherry, 1979).

	Typical range of hydraulic conductivity, K (m/s)
Gravel	10^{-2} to 10^{-1}
Sand	10^{-5} to 10^{-3}
Silt	10^{-8} to 10^{-6}
Clay	10^{-11} to 10^{-9}

consolidation (see Table I). The excess pore pressure, U , is the pressure above normal hydrostatic pressure.

As can be seen the governing equation has the familiar form of a diffusion equation. This is therefore analogous with common diffusion problems such as heat diffusion. The coefficient of consolidation, c_v , in Equation 1 is similar to the heat diffusivity property of materials. The time taken to heat up a sample is proportional to the length scale of the object squared and inversely proportional to the heat diffusivity. Similarly, the time it takes for clay to consolidate is proportional to the thickness of the sample squared and inversely proportional to the coefficient of consolidation.

Equation 1 can be simplified to the well-known expression (Terzaghi's principle):

$$t = \frac{T_v H^2}{c_v} \quad (3)$$

Where t is the time for consolidation to occur and H is the drainage length. For a one-way drainage (i.e., impermeable bottom) the value of H is the same as the soil thickness.

T_v is a time constant related to the percentage complete of the consolidation process. For example, the time factor for 90% of the consolidation to complete is 0.85. Likewise for 50% consolidation to complete the time factor is 0.19. This demonstrates that the latter stages of consolidation take much

longer than the early stages. It takes 4.5 times longer to reach 90% completion than 50%.

The time t is therefore proportional to the thickness of the layer squared and inversely proportional to coefficient of consolidation (and consequently the hydraulic conductivity, K , via Equation 2). The importance of these relationships is demonstrated in Tables II and III where the time to attain 50% and 90% consolidation has been derived for different soil types of varying thicknesses. Typical values of the coefficient of consolidation, c_v , have been given for each soil type based on experimental values presented by Shridharan and Nagaraj (2004) (see Figure 2).

As can be seen there is an enormous range in the predicted consolidation durations depending on the soil type and thickness. In normal civil engineering practice soft clay layers of thicknesses of 5 m to 10 m are usually unsuitable for foundations due to the large settlement times (i.e., greater than 10 years). Therefore, it is common to either use piled foundations or introduce alternate drainage pathways (e.g., wick drains) to speed up the consolidation process.

Of most note, however, are the extremely long timescales required to consolidate very thick clay layers. Time scales in excess of one million years (Myr) would be predicted by the Terzaghi equation for clay thicknesses of 1,000 m or more. There are many sedimentary basins which have thicknesses of this or-

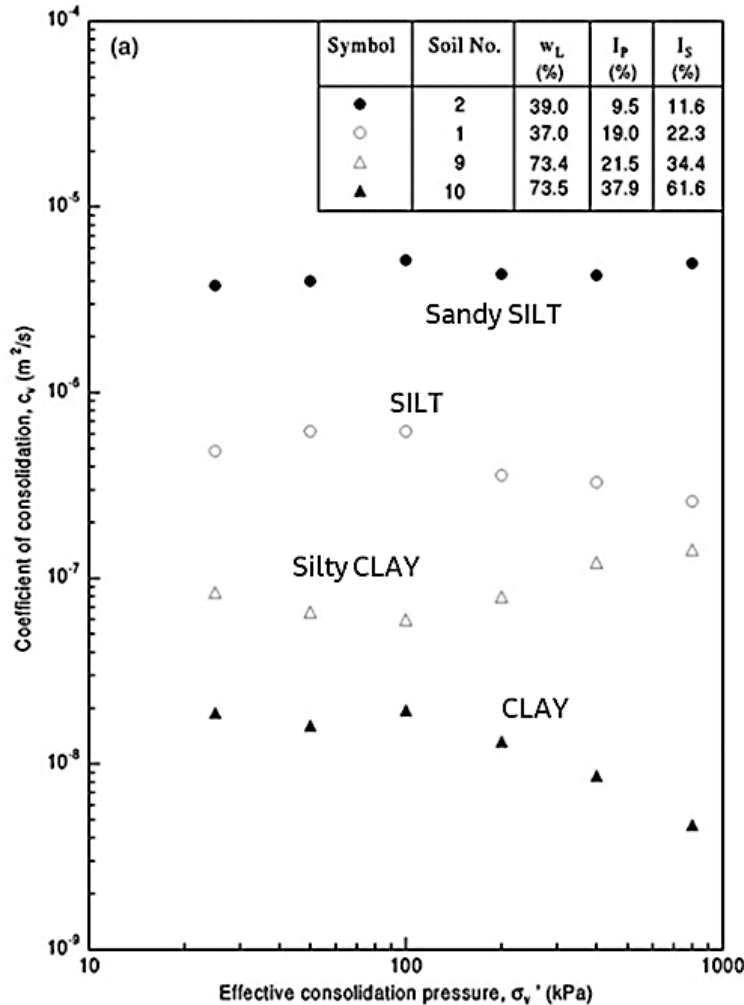


Figure 2. Typical values of coefficient of consolidation, c_v , (from Sridharan and Nagaraj, 2004).

der and even greater such as the Gulf of Mexico, the Caspian Sea, the Labrador Sea and the North Sea.

Klevberg and Oard (2023) provided an example of the duration involved in the consolidation of clay based on experiments carried out for a lithification pilot project. The pilot study was conducted on a sample of fat clay approximately 6 inches high (15.25 cm) and involved applying approximately 6 MPa confining pressure (equivalent to 300 m of overburden). After approximately 6 months of loading the clay sample had under-

gone sufficient compaction to reach the borderline of unlithified sediment and rock. Using Equation 3 estimates for consolidation can be made for field scale thicknesses of clay. If the same experiment was carried out on a 100m thick layer of similar clay in the field and subjected to the same loading of 6 MPa, the time for consolidation would be over 200,000 years. This highlights the crucial role that the thickness of the layer plays in controlling consolidation times. It is not clear that previous Flood Geology models had accounted for this.

Detailed Numerical Modelling of Deposition and Consolidation

Some of the limitations of the simple analytical method presented in the previous section are that it assumes that the settlement is relatively small compared to the thickness of the layer and that the coefficient of consolidation remains constant throughout the settlement process. In order to assess a typical Flood Geology scenario where very large consolidations occur (i.e., transformation from very soft clay to very firm clay or rock), a model is required that can account for these large changes in both the thickness of the layer and any potential change to the coefficient of consolidation during the process.

The present author has developed a finite difference model based on a similar methodology to that presented by Jeeravipoolvarn et al. (2008). The vertical one-dimensional governing equation for the dissipation of the excess pore pressure, U , and the development of the vertical effective stress, σ'_v , is given by:

$$\frac{1}{(1+e_0)^2} \frac{\partial U}{\partial t} + \frac{\sigma'^{(1-B)}}{AB\gamma_w} \frac{K}{1+e} \frac{\partial^2 U}{\partial z^2} +$$

$$\frac{\sigma'^{(1-B)}}{AB\gamma_w} \frac{\partial \left(\frac{K}{1+e} \right)}{\partial z} \frac{\partial U}{\partial z} = 0 \quad (4)$$

Where e is the void ratio and e_0 is the initial void ratio. Parameters A , B , C and D are laboratory determined parameters such that:

$$e = A\sigma'^B \quad (5)$$

$$K = C\sigma'^D \quad (6)$$

It should be noted that the expression in the first term is missing from the equation in Jeeravipoolvarn et al. (2008). However, it does appear that it was included in their actual simulations.

Figure 3 shows the validation of the model against a 10 m-high standpipe test for a material which was 45% clay, 45% silt and 10% sand as reported in Jeeravipoolvarn et al. (2008). The material properties for the model were the same as those used by Jeeravipoolvarn et al. (2008).

$$A = 3.391$$

$$B = -0.308$$

$$C = 6.51 \cdot 10^{-6} \text{ m/day}$$

$$D = 3.824$$

The specific gravity, S_g , of the material was 2.28 and the initial void ratio, e_0 , was 5.17 (equivalent to a porosity of 0.84). These set of parameters produce an average value for the coefficient of consolidation $c_v = 1.10^{-8} \text{ m}^2/\text{s}$ which is typical for a silty clay.

The model gives a very good representation of the settlement over the first 10 years but tends to overestimate the rate of consolidation for the second 10 years. This suggests that these methods may underestimate the time for consolidation. It can be seen, however, that even after 20 years, the material is still consolidating despite having settled nearly 30% of its original height.

By way of comparison with the simple method presented in the previous section, the time required to achieve 50% consolidation for a material 10 m thick and an average coefficient of consolidation of $c_v = 1.10^{-8} \text{ m}^2/\text{s}$ is given by: $T_{50\%} = 0.19 \cdot 10 \text{ m} \cdot 10 \text{ m} / 1.10^{-8} \text{ m}^2/\text{s} = 60 \text{ years}$. This is a similar order of magnitude as the more detailed numerical model showing that the simple Terzaghi model (Equation 3) provides a good first estimate of the likely time for consolidation.

Application of the Numerical Model to a Typical Thick Clay Deposit (Labrador Sea)

In 1985, a number of deep boreholes were drilled in the Labrador Sea off the coast of Greenland as part of the Leg 105 campaign. Holes 646A and 646B

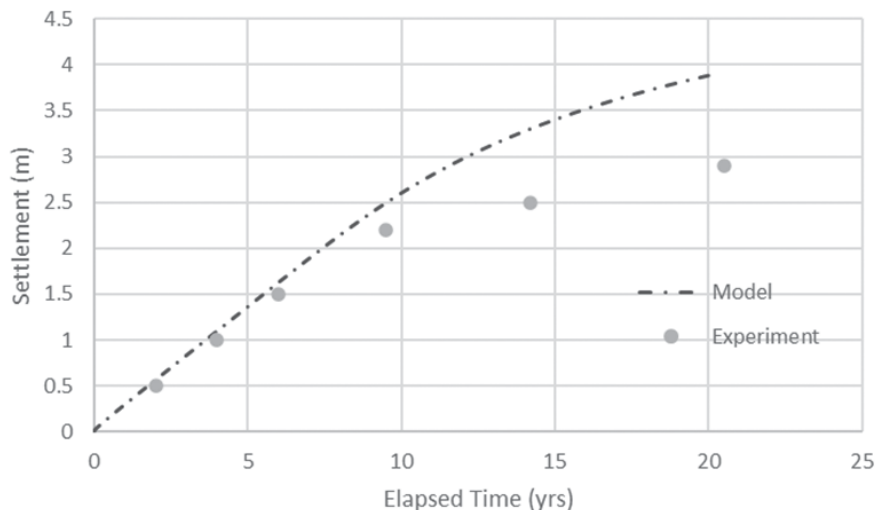


Figure 3. Validation of numerical model against 10 m-high test facility at University of Alberta (Jeeravipoolvarn et al. 2008).

were drilled in approximately 3,500 m water depth (borehole location shown in Figure 2). Hole 646B was drilled to 766.7 m below the sea floor. The upper unit is predominantly a silty clay (0 to 188.2 m below sea floor). The lower unit II is composed of claystone and siltstones (see Table II for a description of the lithology). A full description of the field work is presented in Arthur et al. (1985).

The deposits are fairly recent and are described as being late Miocene to Holocene (i.e., the last 10 million years in geological terms). In flood models, this would be placed either entirely post-Flood or right at the end of the Flood.

The variation of the porosity (volume of pores/total volume), density, and sand/silt/clay content of the strata is shown in Figure 6. This shows a number of key features:

- A relatively uniform grading of material with very little sand over the entire depth and a relatively consistent split of silt to clay (40% silt to 60% clay).
- A consistent reduction of porosity from 0.85 (at seabed level) to

0.4 at depth apart from the non-conformities at 130 m and 330 m below the sea floor.

For the numerical model described in the previous section, the input parameters the values of A, B, C, and D have been chosen to match those of typical silty clay such that:

$$A = 5.5$$

$$B = -0.22$$

$$C = 1.10^{-7} \text{ m/day}$$

$$D = 6.0$$

The values of A and B were derived directly from consolidation tests reported in Dadey and Silva (1989) (Figure 6).

This results in a relatively constant coefficient of consolidation, c_v , of $5.10^{-7} \text{ m}^2/\text{s}$ over the full range of effective stresses which is within the typical range for a silty clay to clay (Figure 7).

In addition to the consolidation aspects of the model, an additional feature to allow deposition has been included. This allows the model to add new layers of material at a designated interval. As the height of the layer of sediment increases, it also consolidates. In cases where the deposition is fast, and the

Table II. Estimate of time to reach 50% consolidation for varying soil types and thicknesses.

	Coefficient of consolidation (m ² /s)	Estimate to reach 50% consolidation (years)		
		10 m-thick layer	100 m-thick layer	1,000 m-thick layer
Fine sand	10 ⁻⁴	0.006	0.6	60
Silty sand	10 ⁻⁵	0.06	6	600
Silt	10 ⁻⁶	0.6	60	6,000
Silt clay	10 ⁻⁷	6	600	60,000
Clay	10 ⁻⁸	60	6,000	600,000
Calcareous ooze	10 ⁻⁷	6	600	60,000

rate of consolidation is slow, the pore pressure increases. This is similar to the processes currently observed in deltaic deposits such as the Ursa Basin in the Gulf of Mexico (Flemings et al., 2012) where the build-up of pore pressure is responsible for large-scale slope failures leading to mass-transport deposits.

The model can also be used to model the development of the shear strength of the clay as the pore pressure dissipates and the material hardens. A typical value for the undrained shear strength, c_u (kPa), can be derived from the effective stress, (kPa), using the following simple relationship:

$$c_u = 0.2\sigma' \quad (7)$$

Typical descriptions of the strength of clay are shown in Table IV.

Another important parameter for tracking the consolidation process is the so-called overpressure ratio, λ^* . This is given by the formula:

$$\lambda^* = U / (U + \sigma') \quad (8)$$

When $\lambda^* = 0$, all of the excess pore pressure has been dissipated, and the fluid is in hydrostatic conditions. This would be the scenario for dissipation over an infinite amount of time. On the

other hand, $\lambda^* = 1$ represents the case when the effective stress between the grains is zero. In this scenario the soil is completely fluidized or liquefied and the solid particles are “floating” in the soil. At this point the soil has no strength and behaves as a fluid. This commonly occurs in loose sands during earthquakes when the pore pressure builds up due to shaking of the soil and reaches a state where the sand liquefies. In clays, high pore pressure prevents the soil strength increasing, and it remains in a fluid-mud situation.

It is common to observe very high overpressure ratios in deltaic areas

Table III. Estimate of time to reach 90% consolidation for varying soil types and thicknesses.

	Coefficient of consolidation, c_v (m ² /s)	Estimate to reach 90% consolidation (years)		
		10 m-thick layer	100 m-thick layer	1,000 m-thick layer
Fine sand	10 ⁻⁴	0.027	2.7	270
Silty sand	10 ⁻⁵	0.27	27	2,700
Silt	10 ⁻⁶	2.7	270	27,000
Silt clay	10 ⁻⁷	27	2,700	270,000
Clay	10 ⁻⁸	270	27,000	2,700,000
Calcareous ooze	10 ⁻⁷	27	2,700	270,000

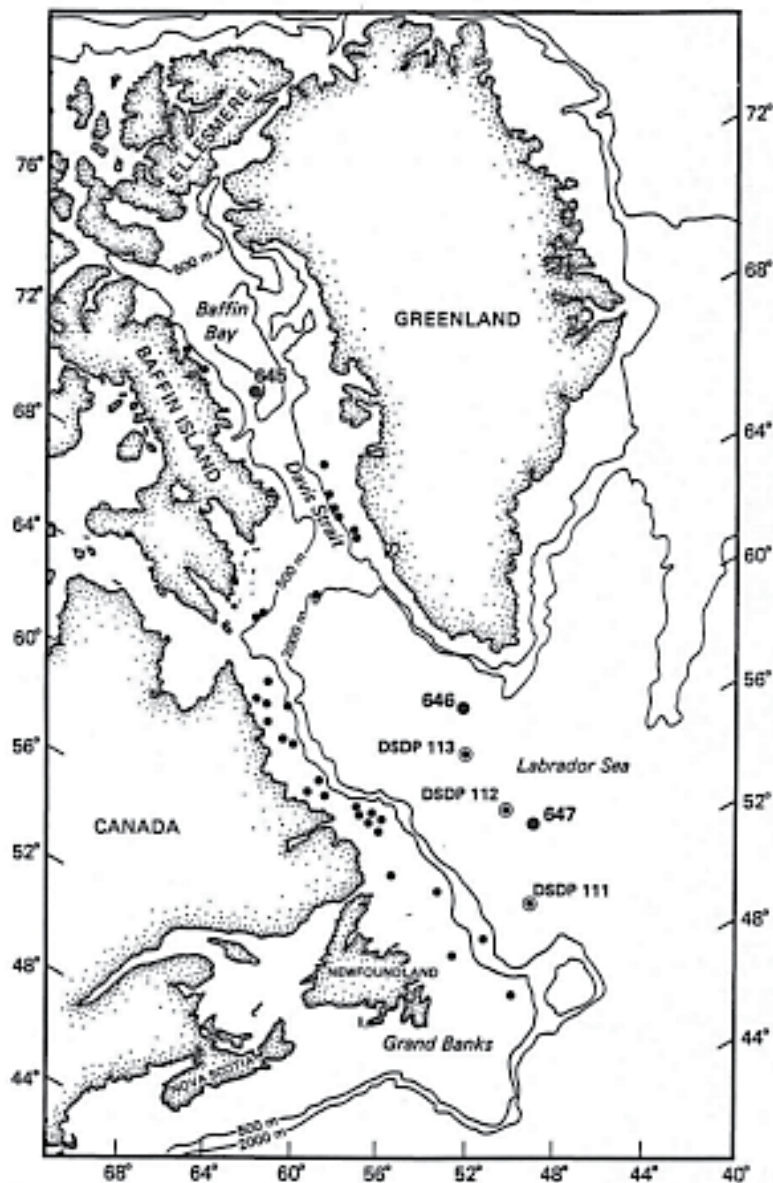


Figure 4. Location of drill site 646 in the Labrador Sea with water depth of 3,500 m (from Arthur et al.,1985).

where sedimentation rates are known to be high. Sawyer et al. (2009) and Flemings et al. (2012) presented measurements of porosity and pore pressure from the Ursa Basin on the Gulf of Mexico continental slope and demonstrated that there was a very high risk of submarine landslides when $\lambda^* > 0.7$ in clay deposits. This is evidenced by the widespread occurrence of mass trans-

port deposits (MTDs) which are easily recognizable in the sediment strata via geophysical surveys.

Therefore, when assessing the results of the numerical model values of $\lambda^* > 0.7$ would be considered likely to produce slope failures and to be unstable for slopes steeper than 1.5° . Values of $\lambda^* > 0.9$ are likely to be unstable for very flat slopes of $< 1^\circ$.

Scenario 1—Flood deposit hypothesis (deposition in 100 days)

This scenario represents the case where all the material is deposited during the Flood. Given that lower strata are probably also assumed to have been deposited earlier in the Flood, this represents a conservative estimate of the duration over which to calculate an average deposition rate. It also assumes that the underlying strata have already hardened and hence the flow of the escaping pore water is upwards. It also assumes that the layers are relatively horizontal, and that the horizontal component of the pore-water flow is negligible.

Looking at the borehole records, we could assume an average porosity of 0.55 over the 770 m depth (Figure 5). This represents a total mass of clay (excluding the pore water) of:

$$\text{Total mass of clay} = (1-0.55) * 2650 \text{ kg/m}^3 * 770 \text{ m} = 918225 \text{ kg/m}^2$$

The value of 2650 kg/m^3 is the assumed density of the clay particles.

Using this value, the average deposition rate over 100 days is $0.106 \text{ kg/m}^3/\text{s}$. It should be noted that this value is almost two to three times higher than the maximum mass settling flux observed in the field (see Winterwerp, 1999; Soulsby et al., 2013).

The model adds this mass at an initial concentration of 300 kg/m^3 which equates to a porosity of 0.89 (initial void ratio of 7.8). This is a typical value for the starting point of consolidation of predominantly clay materials. In reality the transition from a fluid mud of concentration 50 kg/m^3 to a very weak clay of concentration 300 kg/m^3 make take place over the course of weeks. However, this period has been neglected in the study due to its relatively fast timescales.

Figure 8 shows how the properties of the deposited clay develop with time. The curves are plotted for three specific times: 1 year after the commencement of deposition, 100 years after, and 10,000 years after. The following observations are made:

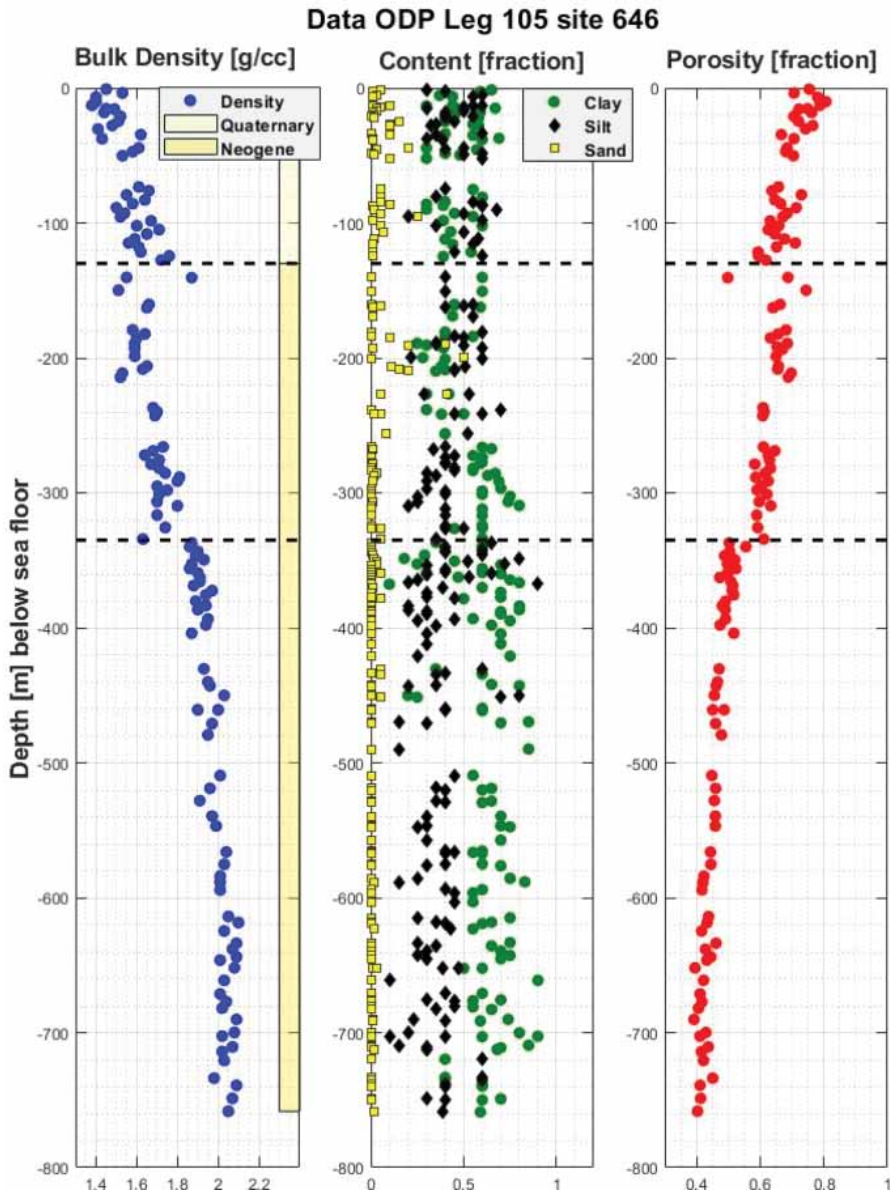


Figure 5. Summary of bulk properties from borehole 646B (from Orozova-Bekkevold and Petersen, 2021).

- After 1 year, there is practically no consolidation of the clay and the full 3100 m is still in its original deposited state (consistency of a thick slurry unable to carry any loading)
- After 100 years, approximately 1200 m of consolidation has taken place. However, there is still almost no

reduction in the overpressure ratio or any gain in strength. The soil will still be in a practically fluidized state.

- After 10,000 years, the strength of the lower 100 m has increased to that of a low-strength clay (between 20 to 40 kPa). The settlement has increased to 1800 m.

Scenario 2—Post-Flood deposit hypothesis (deposition in 100 years)

In this case, the same volume of sediment ($900,000 \text{ kg/m}^2$) is deposited over 100 years and then allowed to consolidate. This is similar to some of the post-Flood deposition hypotheses which postulate that some of the more recent deposits (Cenozoic, last 66 million years) are due to post-Flood deposition that may have occurred as the world established its current day state after the cataclysm of the Flood. Those that hold this view suggest that there was still a high rate of cataclysmic events for a few hundred years after the Flood (i.e., residual catastrophism during the first half of the post-Flood “Ice Age”) that could have produced deposits such as those of the Labrador Sea.

As with Scenario 1, sediment is added to the model at a concentration of 300 kg/m^3 and therefore ignores the hindered settling phase. The sediment is added at a uniform rate of 24.6 kg/day/m^2 .

As can be seen from Figure 9, the results after 100 years and 10,000 years are similar to those from Scenario 1. Again, the shear strength of the clay after 10,000 years is still very soft over the top 1000 m and only gains low-to-medium strength in the bottom 100 m. The reason for the similarity with Scenario 1 is because the deposition rate is still much higher than the rate of settlement.

Scenario 3—Slow deposition hypothesis (deposition over standard geological time of nine million years)

The traditional geological understanding of the Labrador Sea deposits is that they formed over a period of approximately nine million years with an average deposition rate of 80 m/Myr (see Srivastava et al., 1987).

The results of the analysis for this scenario are shown in Figure 10. This shows that the undrained shear

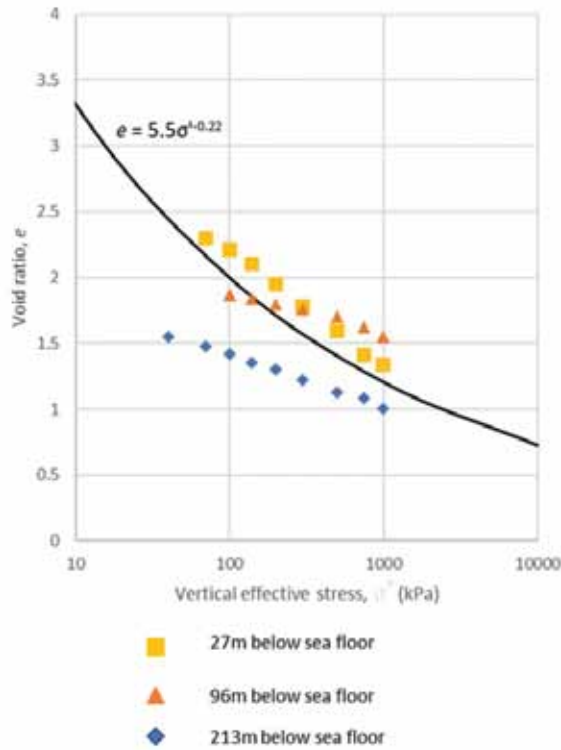


Figure 6. Void ratio vs. logarithmic effective stress (fitted curve vs. experimental data at three depths for borehole 646B).

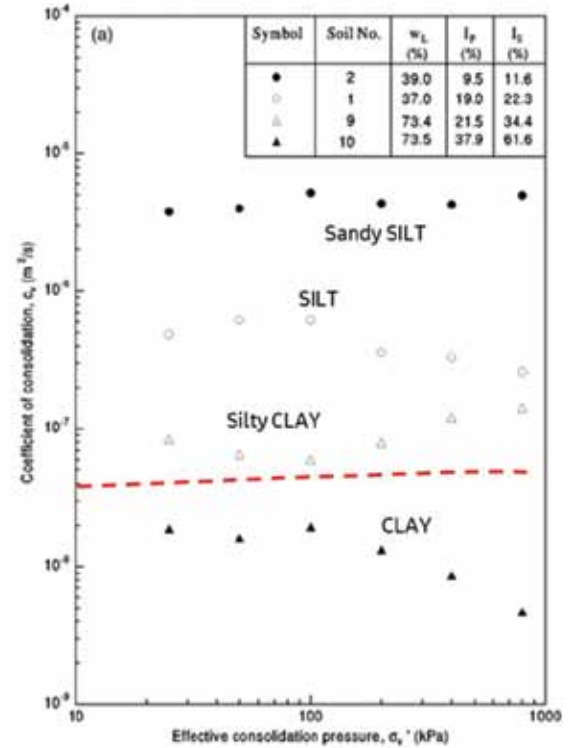


Figure 7. Modeled coefficient of consolidation, c_v , compared with experimental values (from Sridharan and Nagaraj, 2004).

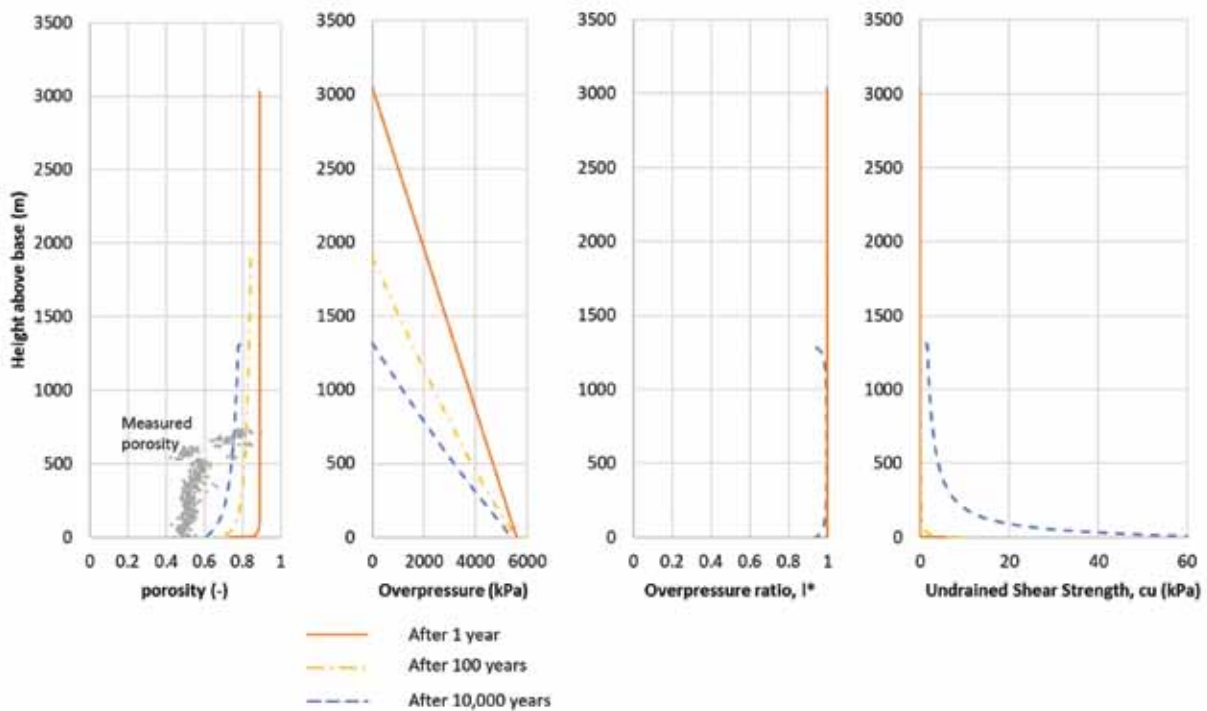


Figure 8. Scenario 1 (Flood deposition in 100 days).

Table IV. Typical definitions of clay strength (from Table V. British Standards BS EN ISO 14688-2).

Description of Clay	Undrained shear strength c_u (kPa)
Extremely low	<10
Very low	10 to 20
Low	20 to 40
Medium	40 to 75
High	75 to 150
Very High	150 to 300
Extremely High*	>300

* Materials with shear strength greater than 300 kPa may behave as weak rocks and should be described as rocks according to ISO 14689-1.

strength has developed to a point that the lower 400 m would be characterized as rock (i.e., $c_u > 300$ kPa) and is consistent with the borehole logs which characterized the bottom 400 m as either siltstone or claystone. The total thickness is estimated to be approximately 730 m which corresponds with the measurement of 770 m.

Physical Constraints on Depositional Rates

The analysis in the previous section highlighted that rapid sedimentation rates often postulated by Flood Geology models leads to unsustainably high overpressures as the dissipation of the pore water cannot keep up with the load being applied as new sediment is deposited on top. Gibson (1958) proposed the following non-dimensional time factor, T_g , which provides a measure of the balance between sedimentation rate (how quickly load is applied to the existing material) and the coefficient of consolidation, (a measure of how quickly the soil can dissipate the excess pore pressure):

$$T_g = m^2 t / c_v \quad (9)$$

T_g is a dimensionless time factor that controls the degree of overpressure build-up during deposition, m is the sedimentation rate in m/s, c_v is the coefficient of consolidation in m^2/s and t is the total time over which the sediment is deposited. In general, to prevent significant overpressure building up T_g should be less than one.

For the three scenarios tested in the previous section the values of T_g can be calculated using Equation 8. It should be noted that the sedimentation rate is usually calculated assuming a well-compacted state rather than the initial, very-loose state. For this purpose, an average porosity of 0.55 is assumed giving a total deposition height of 770 m. A constant value of $c_v = 5.10^{-8} m^2/s$ is used for all the calculations.

Scenario 1 (Flood deposit in 100 days)

$$m = 770 \text{ m} / 100 \text{ days} = 7.7 \text{ m/day}$$

$$T_g = 1.3.10^6$$

Scenario 2 (post-Flood deposit in 100 years)

$$m = 770 \text{ m} / 100 \text{ years} = 7.7 \text{ m/year}$$

$$T_g = 3.7.10^3$$

Scenario 3 (deposition over 9 million years)

$$m = 770 \text{ m} / 9 \text{ million years} = 85 \text{ m/Myr}$$

$$T_g = 0.04$$

These results highlight why the deposition rates assumed in either Flood (Scenario 1) or post-Flood (Scenario 2) models give rise to completely unstable soil conditions with effectively no undrained shear strength. The sedimentation rates are orders of magnitude higher than the dissipation potential of the clay and, hence, it is almost completely fluidized even in the post-Flood scenario. By way of comparison with present-day field observations, it is common for submarine landslides to be prevalent in areas where the average sedimentation rate exceeds 0.1m/yr.

Implications for Dinosaur Tracks During the Flood

It is common for Flood models to include hypotheses relating to the formation of dinosaur footprints during the Flood. These hypotheses usually assume that, during the course of the Flood, dinosaurs may have walked across freshly deposited sediment as the Floodwaters rose. However, this would require that the freshly deposited sediment had sufficient strength to support the weight of a large animal.

By way of comparison, elephants produce average bearing pressures under their feet of the order of 250 kPa (Panagiotopoulou et al., 2016). In a clay, this requires an undrained shear strength of approximately 50 kPa to support this pressure. This corresponds to a moderate-strength clay. As discussed in the previous section, this degree of strength is highly unlikely to develop in silts or clays within the timeframe

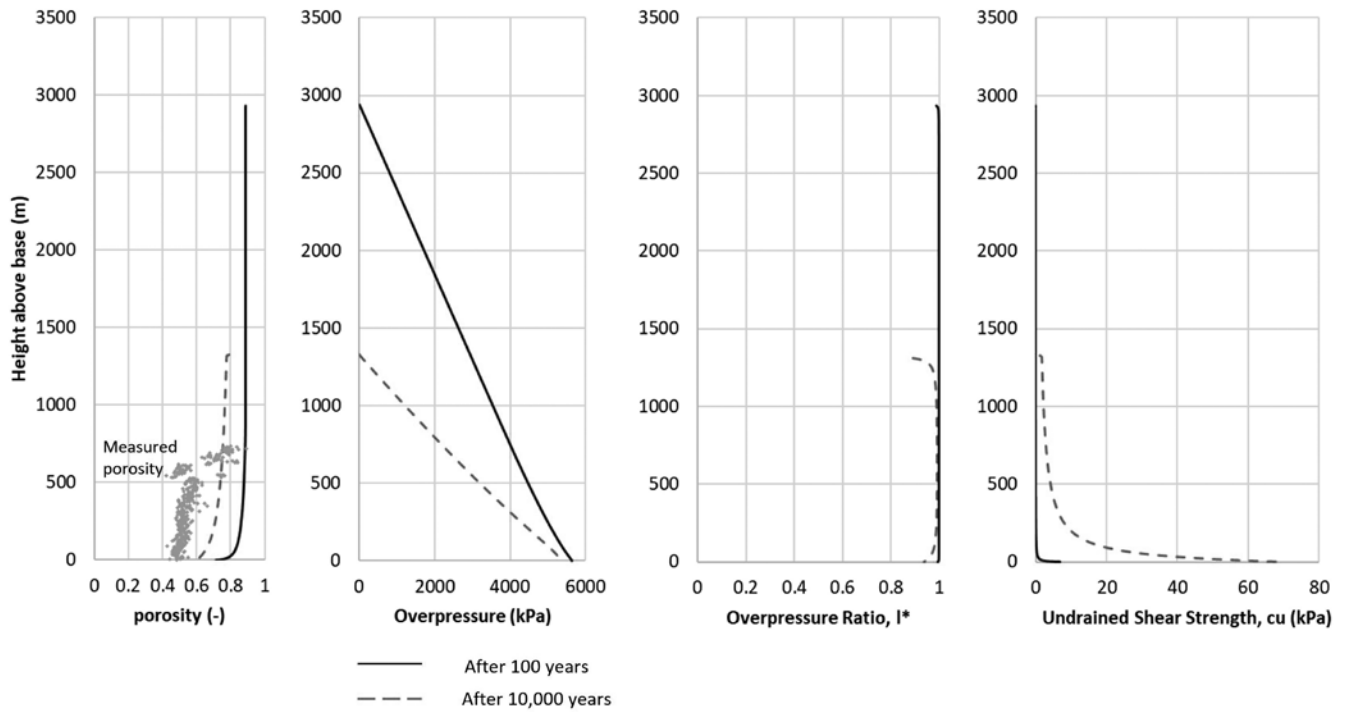


Figure 9. Scenario 2 (Post-Flood deposition over 100 years).

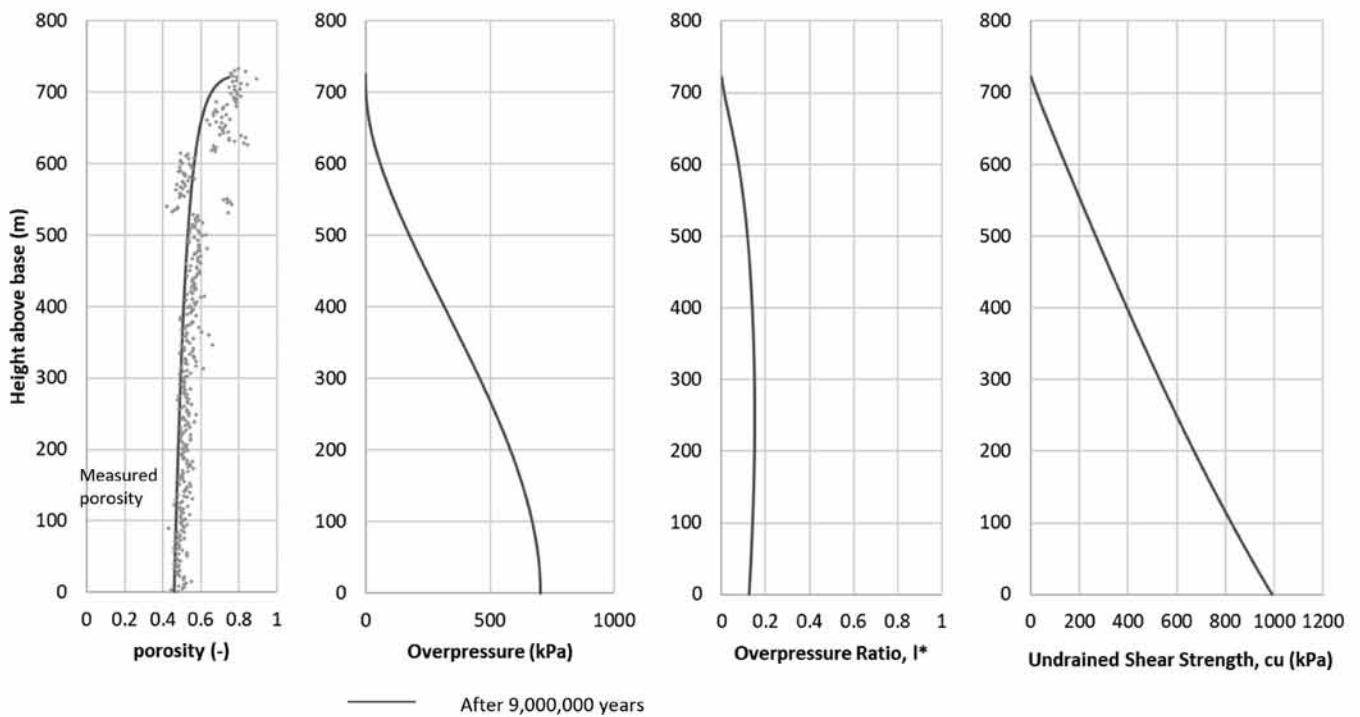


Figure 10. Scenario 3 (slow deposition over nine million years).

of hours or days and therefore it is difficult to conceive how dinosaurs could walk on freshly deposited material other than that with high sand content which would develop bearing capacity quickly.

The dinosaur track hypotheses should therefore be tested at each site against the likelihood of the freshly deposited material being able to withstand the bearing pressure of the animal. In most cases the foot area is preserved in the rock and an approximate weight of the animal is usually known allowing an estimate of the bearing pressure. Using the techniques described in this paper, the rate of gain-of-strength of the sediment can be estimated and tested against the required bearing capacity using the common formula that bearing capacity is equal to 5.14 times the undrained shear strength of the material.

Limitations and Uncertainties of the Models

Due to the extremely large range in the permeability of soil (up to six orders of magnitude difference between sand and clay), predictions made by the models presented in this paper are typically only accurate to within an order of magnitude. Also, complexities of soil profiles, presence of layers, and potential for horizontal flow may require full three-dimensional models of consolidation to be made to assess timescales. These models are commonly used in the oil and gas industry to describe the build-up and flow of hydrocarbons and are readily accessible to trained professionals. These tools would allow Flood Geology hypotheses to be tested in very complex geologies.

Conclusions

The purpose of this article was to quantitatively examine the rapid-rock formation hypotheses that are fundamental to Flood Geology models. In particular this paper has studied the timeframes

required for the first phase of lithification, mechanical compaction under self-weight. The study used well-established analytical and numerical methods commonplace in geotechnical engineering.

The following general conclusions can be made:

- There is a very large change in volume required to consolidate mud to stiff clay (approximately 4 to 1) or to claystone (approximately 10 to 1). This would mean that for every 100 m of claystone created, 1000 m of freshly deposited clay is needed.
- The primary constraint on the rate of consolidation is the permeability. The maximum velocity that water can be expelled from a soil is equal to the hydraulic conductivity, K , which for clays is in the order of 10^{-11} to 10^{-9} m/s (0.3 mm/year to 30 mm/year). This highlights the extremely slow nature of fluid flow in clay.
- Basic soil mechanics shows that consolidation times for 1000 m-thick clay layers are in the order of millions of years.
- If deposition rates in clay exceed approximately 0.1 m/year, a high degree of overpressure will form leading to geotechnical instability such as submarine landslides or even complete fluidization of the soil. The rates proposed in both Flood models (average sedimentation rate of 10 m/day) and post-Flood models (average sedimentation rate of 10 m/year) are between a hundred to one million times higher than this physical limit.

Even allowing for uncertainty in the geotechnical parameters and the assumptions regarding one-dimensional vertical flow (i.e., no horizontal flow), it is difficult to see how the consolidation of clay as understood by present-day geotechnical engineering formulations can accommodate the rapid deposition and consolidation of clay within young-Earth timeframes, whether that be during the Flood or post-Flood. In order to provide credible Flood Geology

models, it will therefore be necessary to propose mechanisms that can account for accelerating the consolidation phase by many orders of magnitude compared to standard soil mechanics.

However, as highlighted in this paper, there are physical limits to the rate of consolidation that cannot be exceeded without fluidizing the soil and losing all of its strength. Even clay layers that are sandwiched between sand layers cannot be loaded at rates beyond those presented in this paper without creating excessive overpressure and weakening the clay. This would ultimately result in the overlying sand layers punching through the weak clay.

It is therefore recommended that initial hypotheses are tested against two basic rules of thumb to confirm feasibility:

- a) Time (in seconds) assumed for rock formation $< H^2/c_v$, where H (m) is the thickness of the layer in question and c_v (m^2/s) is the coefficient of consolidation. In the absence of any specific site data, the values presented for c_v in Tables II and III can be used.
- b) The maximum sedimentation rate, m (m/s) $< \sqrt{c_v/t}$, where t (s) is the duration of the sedimentation process. This would ensure that excess pore pressures remain below limits that could result in large-scale geotechnical instabilities.

The above formulae are applicable for all fine-grained material where consolidation is likely to be problematic including silts, clays, and oozes. It is unlikely that sand or coarser-grained materials will experience such issues.

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What Is the Meaning of the Floods on Mars?

CREATION RESEARCH SOCIETY QUARTERLY

Part II: Uniformitarian Origin Theories and Conundrums

Michael J. Oard

Key Words: catastrophic floods, glaciation, Global Equivalent Layer (GEL), impacts, lava flows, Mars ocean, outflow channels, rover results, valley networks, volcanism

Abstract

Martian outflow channels and valley networks raise six questions and the first four are addressed in this part: 1) how were outflow channels and valley networks carved, likely from water?; 2) Were the channels and valley networks eroded by a few catastrophic floods or many small flows?; 3) What is the origin of the water: groundwater, rainfall and runoff, or both? If groundwater, how was it recharged?; and 4) What is the quantity of water needed for erosion; estimates varying from 3 m to 5000 m GEL. Ultimately, did water come from impacts, volcanism, or both?

Introduction

Mars is a planet of contradictions. Planetary scientists were surprised to find evidence of water in the past, yet secular climate models indicate Mars was always cold and dry. Floods apparently produced both outflow channels and valley networks (VNs). Most VNs are in the southern highlands. They are generally about 1 to 5 km wide, about 50 to 350 m deep, and are up to 4000 km long (Howard et al., 2005). They exhibit interesting features. Some are of constant width. VNs have a patchy distribution, are immature, follow the

surface topography, and show evidence of both overland water flow and groundwater sapping.

Outflow channels, much wider than VNs, show evidence of water erupting from the ground. The largest outflow channel is Kasei Valles, over 400 km across, over 2.5 km deep, and about 2000 km long (Carr, 2006, pp. 113–131). This outflow channel is much larger than Grand Canyon and suggests flooding up to 100 times the flow of the Lake Missoula megaflood on Earth.

Adding to the mystery, Mars exhibits subsurface ice in the middle and high

latitudes and 2-to-4-km thick ice sheets at the poles. There has been significant volcanism, and Mars once had a powerful magnetic field, producing magnetic anomalies about 10 to 20 times the intensity of those on Earth. Like other solid bodies of the Solar System not resurfaced by impact debris and lava flows, Mars has numerous impact craters, some very large. Planetary scientists have great difficulty explaining these features, which suggests an alternative history may be more successful.

Six Major Questions

VNs and outflow channels raise six major questions (Carr and Malin, 2000, p. 366):

“(1) whether the channels and valleys were cut by water, ice, or some other fluid, and if they were cut by water, as seems likely, then (2) what [sic] the relative roles of catastrophic floods versus sustained but modest flow have been, (3) where the water came from (groundwater sapping vs surface runoff), (4) how much water was involved, (5) where the water went, and (6) what the channels and valleys imply for the planet’s climate history.”

Here, and in Part III, I will address these six questions from the Biblical, creationist worldview.

1) Were the Outflow Channels and VNs Carved by Lava, Ice Melt, or Water?

What processes created VNs and outflow channels? Water would be an obvious answer, but not on a uniformitarian Mars. Alternate uniformitarian mechanisms are runoff from ice melt and lava erosion. But there is little or no evidence for ice in equatorial latitudes, where VNs predominantly occur, except at high elevations such as the Tharsis region (Schon and Head, 2012). So, ice-melt is unlikely. The best-developed alternative is erosion by low-viscosity lava.

Were Outflow Channels Carved by Lava?

Leverington (2011, 2018, 2021) noted many problems with water erosion on Mars, especially the volume required, which he estimated at between 200 and 1400 m Global Equivalent Layer (GEL), the average water depth equalized over the entire globe. Others have suggested up to 5 km GEL (Luo et al., 2017). Since water for outflow channels originated below the ground, the porosities and permeabilities of Martian rocks are far from adequate to support such huge eruptions. They would also require large liquid reservoirs, but scientists believe at least several kilometers of the subsurface

is frozen. Leverington also notes the outflow channels do not have expected properties. Water-related sediments, such as clays, sulfates, halides, and hydrated minerals, though widespread, are rare in outflow channels and VNs. Moreover, easily weathered minerals, such as olivine, are also common, arguing against widespread, long-lasting wet conditions.

Leverington advocates outflow channels being shaped by voluminous effusions of low-viscosity lava. He points to channels eroded by lava on the Moon, Mercury, Venus, and Earth. Large volumes of lava would be a natural and expected process of planetary geology. With turbulent flow, it would have rapidly eroded channels, essentially mimicking water. That would eliminate the conundrums presented by water erosion. Leverington claims that flowing lava can explain features associated with megafloods, such as the dry cataracts and streamlined erosional remnants of the Channeled Scablands.

But that theory has its own problems. The most basic aspects of lava flow and

incision, such as mechanical and thermal processes, are not well understood (Leverington, 2021). Although lava flows are found in some outflow channels, they are mostly aggradational and not erosive (Dundas and Keszthelyi, 2014). Some outflow channels are thousands of km long and more than a km deep, requiring much lava. Kasei Valles would require over one million km³ of lava. Such volumes are not evident at the channel mouths.

Outflow Channels and VNs Carved by Water

These problems suggest that the only reasonable answer to the first question is that liquid water eroded the VNs and outflow channels (Wordsworth, 2016).

Ubiquitous Evidence of Water

Recent satellite images are consistent with this answer which was proposed in the 1970s (Ramirez et al., 2014). Besides Channeled Scabland features, such as streamlined hills (Figure 1), there is evidence of paleolakes, alluvial fans, deltas (Figure 2), and layered sediments



Figure 1. Streamlined form around an impact crater in Lethe Vallis outflow channel (NASA/JPL-Caltech/Univ. of Arizona).

(Figure 3) formed by precipitation and runoff (Davis et al., 2021). Strong evidence exists for hundreds of paleolakes; one in McLaughlin Crater was 500 m deep and contained 1500 km³ of water (Michalski et al., 2019). A new global compilation of craters with alluvial fans and deltas on Mars indicate that there are 314 craters with 890 alluvial fans and 114 deltas, indicating widespread precipitation and runoff (Wilson et al., 2021). Turbet et al. (2020) state that the evidence for water on the planet is overwhelming: high erosion rates, sedimentary deposits, hydrated minerals, dry riverbeds, and lakes. Moreover, some crater rims and central uplifts have been eroded by water, with sedimentary deposits in the craters (Forsberg-Taylor et al., 2004). These features are dated as Noachian (Table I), probably because that period is believed to have been warm and wet.

The awesome fan delta is a sedimentary deposit from Neretva Vallis. It was formed when a massive amount of water left the valley and spread into a lake in the crater. The image is from the High Resolution Imaging Experiment (HiRISE) camera aboard NASA's Mars Reconnaissance Orbiter that has a resolution as low as 0.25 m.

Clay minerals from water are common (Ramirez and Craddock, 2018). Some clays suggest temperatures of 298–323°C (Ramirez, 2017). Prehnite, a hydrated silicate, is found on Mars and requires temperatures of 200–400°C to form (Ehlmann and Edwards, 2014). It was likely excavated by impacts. Surface outcrops, dated to the Noachian, have chemically altered minerals (Haberle et al., 2019; Riu et al., 2022), but most of the surfaces have unweathered basalt with olivine, pyroxene, and feldspars (Jakosky and Mellon, 2004); all of which weather rapidly. The olivine enrichment at the surface likely was caused by impacts (Ehlmann and Edwards, 2014). Olivine is ubiquitous at craters greater than 10 km in diameter (Carter

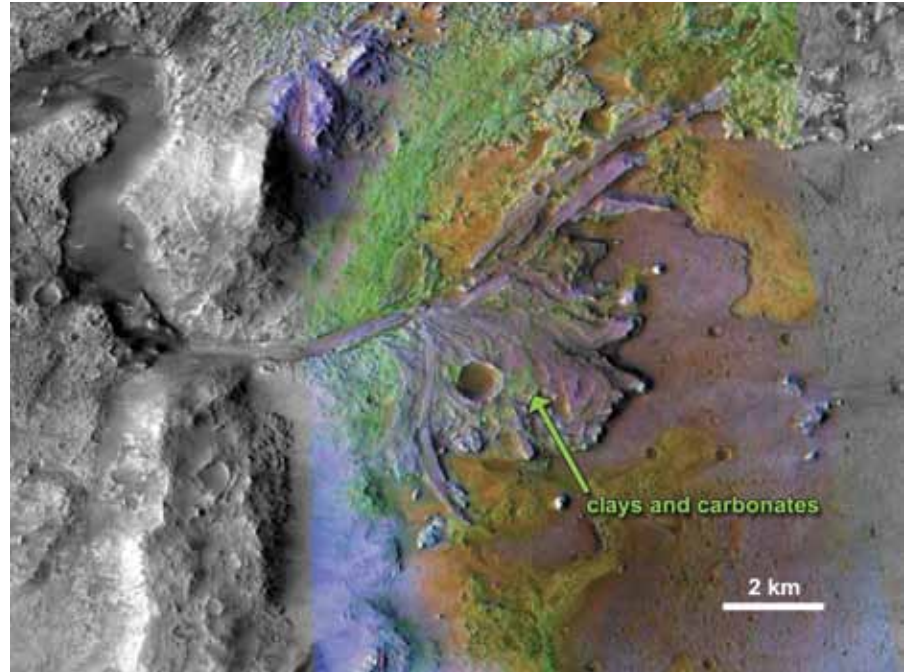


Figure 2. A fan delta in Jezero Crater, Mars, 48 km in diameter, where the Perseverance rover landed on February 18, 2021 (NASA/JPL-Caltech).

et al., 2010). How could many easily-weathered minerals have persisted in a warm, wet climate for tens of millions of years? Ehlmann and Edwards (2014, p. 306) conclude: “There remains numerous puzzles and key questions about the mineralogy of Mars that build upon the discoveries above.”

Martian weathering profiles range from a few centimeters to 100 m thick (Bultel et al., 2019). A few areas, such as Syrtis Major have layered sulfates up to 600 m thick (Quinn and Ehlmann, 2019). These sulfates may be evaporites that contain water or were deposited during catastrophic chemical precipitation. The most abundant clay mineral is Mg/Fe smectite (Scheller et al., 2021), overlain by Al smectite, but sometimes that order is reversed (Carter et al., 2015; Buczkowski et al., 2020). This weathering profile was likely caused by acid rain resulting from the formation of sulfuric

acid from SO₂ emitted by volcanoes (Loizeau et al., 2018; Bultel et al., 2019). Sediments with halide mineralogy are also abundant (Fernanders et al., 2022). Carr (2006, p. 113) summarizes the arguments for a liquid-water origin of outflow channels:

“However, the close resemblance of the channels and valleys to terrestrial water-worn features, the abundant presence of water ice, the finding of evaporites in Meridiani Planum and elsewhere, and the difficulties with other erosive agents, make it almost certain that the principal erosive agent that cut most of the channels and valleys was liquid water.”

Surface Rover Results Support Liquid Water Erosion

Surface rovers' data support water erosion on Mars. The Curiosity rover that



Figure 3. Perseverance image of layered sediments in Jezero Crater, Mars, on April 18, 2021 (NASA/JPL-Caltech/ASU/MSSS). The foreground flat-topped hill, informally named “Kodiak,” is 2.2 km from the rover and 250 m wide. It exposes ancient, layered rocks indicating gradual deposition of sediments in a river delta, followed by floods.

Table I. The four periods of Mars’ alleged uniformitarian history.

Period	Date (billion years = Ga)
Pre-Noachian	Before 4.1 Ga
Noachian	4.1 to 3.7 Ga
Hesperian	3.7 to 3.0 Ga
Amazonian	3.0 Ga to present

landed in Gale Crater on August 6, 2012 (Figure 4), especially has shown much evidence for flooding, for example fans and deltas (Palucis et al., 2014, 2016). Curiosity proved that what was thought to be a lava flow was actually sedimentary rock (Voosen, 2021). Curiosity also found evidence for a lake in the crater (Edgar et al., 2020; Fraeman, 2021). The rover also discovered a 5 km-tall mountain called Mt. Sharp (Aeolis Mons), composed of layered rock that is possibly fluvial or lacustrine in origin (Fraeman, 2021) with possibly a buried central peak (Grotzinger et al., 2015). Mt. Sharp and the crater rim have been fluvially incised (Williams et al., 2013). Minerals in the lower strata of Mt. Sharp indicate liquid water, and include phyllosilicates (clays), hydrated silica, sulfates, and iron oxides. Sandstones and conglomerates have also been observed forming a network of braided river channels originating on Gale’s northern rim and flowing south. The Curiosity rover discovered gravel bars with evidence of minimum water flow of at least 10 m/sec (Heydari et al., 2020). Laminated mudstone has also been discovered.

The age of Gale Crater is said to vary from early Noachian to early Hesperian (Table I), depending upon the dating method used (Heydari et al., 2020), showing the uncertainty in crater counting ages. Voosen (2021, p. 871) states:

“Any date [from radioactive dating on returned lava samples] will also help pin down the highly uncertain overall martian timeline, currently dated by counting the number of craters on a given terrain.”

The new Perseverance rover landed in Jezero Crater on February 18, 2021, and has discovered water- and wind-eroded features, 40-meter-high cliffs of a river delta, and water locked up in minerals (Witze, 2021). This crater was once home to a lake with evidence of powerful flash floods and a delta (Anonymous, 2021).

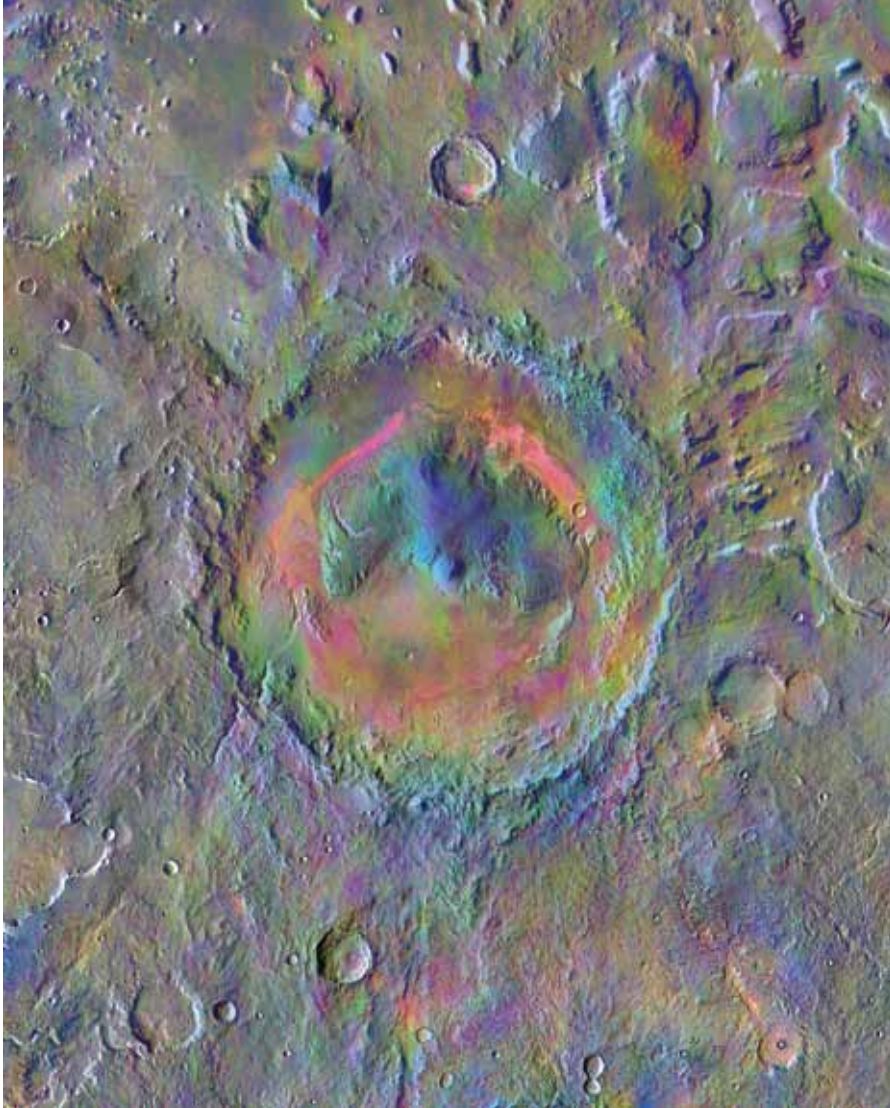


Figure 4. Gale Crater, 150 km in diameter, surface minerals, color coded, from THEMIS (NASA/JPL-Caltech/ASU). The high area at the top of the crater is Mt. Sharp. Windblown dust appears pale pink and olivine-rich basalt looks purple. The bright pink on Gale's floor appears due to a mix of basaltic sand and windblown dust. The blue at the summit of Gale's central mound, Mount Sharp, probably comes from local materials exposed there. The typical average Martian surface soil looks grayish-green.

Was There an Ocean in the Northern Lowlands?

Water erosion in a warm, wet climate would be aided if an ocean once covered the northern lowlands (Parker and Bills, 2021). Two shorelines have been suggested: the lower Deuteronilus level

and the higher Arabia level (Sholes et al., 2021), but recent mapping has shown the putative shorelines vary laterally by hundreds of kilometers and vertically by up to 2.2 km! Some think that the warping of the shorelines occurred during true polar wandering caused by

the Tharsis volcanic plateau (Citron et al., 2018). Some have claimed that a large bolide hit the ocean and caused tsunamis that spread southward, overran the shorelines, and backwashed northward into the "ocean" (Rodrigues et al., 2016). Others point to fans and deltas at the dichotomy boundary as evidence of an even higher shoreline (Fawdon et al., 2018), well above the two proposed shorelines (Rivera-Hernández and Palucis, 2019).

Many problems are associated with a northern ocean; some believe there is no evidence for it (Carter et al., 2010). It is true that water from outflow channels would end up in the northern lowlands, which it did, and if an ocean was formed it would quickly freeze and take hundreds of thousands of years to sublimate (Turbet et al., 2017).

2) Were the channels and valley networks eroded by a few catastrophic floods or many small flows?

The second question is: "How did water carve the VNs and outflow channels?" Was it by rare catastrophic flows or numerous, more modest floods (Carr, 2006, p. 135; Hargitai et al., 2017)? Scientists argue for both (Carr, 2006, p. 113; Goldspiel and Squyres, 2011). Evidence is accumulating that strongly favors catastrophic floods, which heightens questions of their origin.

A detailed analysis of the origin of VNs from breaches of over 200 paleolakes shows that some valleys formed by catastrophic lake breach (Goudge et al., 2018). Energy from an initial breach would erode the VNs quickly since discharge would be sufficiently high to maintain cobbles in suspension. Subsequent smaller floods, with much less erosive energy, would form lower terraces, which are hardly ever observed. The evidence for rare catastrophic floods forming VNs has reinforced the opinions of many researchers who have

concluded that the origin of outflow channels was likewise catastrophic (Carr, 2006, p. 113).

The catastrophic origin of VNs is supported by the angle of tributaries that enter the main VNs, called *the branching angle*. Examining branching angles for main-stem rivers and streams across the United States, researchers determined that in more humid environments with more groundwater flow, angles of entrance tend to be higher. But in the dry southwestern United States, branching angles are more acute (Seybold et al., 2018). This result is independent of other variables. The tributaries of VNs on Mars branch at lower, acute angles, suggesting that Mars VNs were caused by brief catastrophic floods:

“The correlation of branching angles with climatic controls supports the recent shift from groundwater-dominated theories for Martian channel formation ... to more recent precipitation-based theories.... Our analysis suggests that Mars’ channel networks were formed in an arid continental climate with sporadic heavy rainfall events large enough to create significant surface runoff.” (Seybold et al., 2018, p. 3)

This suggests at least episodically warm temperatures during VN formation (Cang and Luo, 2019). Thus, VNs were apparently formed by catastrophic flows. This conclusion is reinforced by a large amount of recent research which also shows that most of the valleys were formed quickly by large surface flows of water (Mangold, 2012; Seybold et al., 2018).

3) What was the origin of the water: groundwater, rainfall and runoff, or both?

The third question is whether erosion was surface erosion from rain and runoff or by groundwater? A more basic question is where did the water come from in the first place?

VNs Formed by Groundwater?

Some researchers have suggested in the past that the outflow channels and VNs were carved by streams that originated from groundwater springs (Malin and Carr, 1999; Goldspiel and Squyres, 2000; Aharonson et al., 2002), possibly from a pressurized aquifer (Cassanelli and Head, 2019). Groundwater sapping is suggested for VNs having a box-canyon morphology (Howard, 2007).

VNs Formed by Rainfall?

Most planetary scientists have concluded VNs were eroded by rainfall and subsequent runoff. Evidence for precipitation is seen in small tributaries starting on divides (Fassett and Head, 2008). This is reinforced by the observation that some valleys start on volcanoes (Hynek et al., 2010), and some craters were eroded by rainfall (Craddock and Lorenz, 2017).

VNs Carved by Both Rainfall and Groundwater

Since there is evidence for a groundwater origin for some VNs, especially in their upper reach tributaries, some have suggested that VNs originated from *both* groundwater and surface precipitation (Shi et al., 2022). This does not weaken the case for rainfall, since it is needed to recharge aquifers.

Outflow Channels Did Form from Groundwater

However, outflow channels start from either grabens or below *chaos regions*, suggesting a groundwater origin (Meresse et al., 2008; Roda et al., 2017). Chaos regions generally consist of irregular groups of large blocks, some tens of kilometers across and hundred or more meters high. The tilted and flat-topped blocks form depressions hundreds to several thousand meters deep. However, groundwater alone is inadequate for the volumes of water released (Harrison and Grimm, 2008). One problem is the frozen ground; another is the low

permeability of unfrozen ground. Large groundwater-sourced floods would require high permeability over a large area (Leverington, 2021); so, how are outflow channels to be explained? Part III of this series of papers will suggest a solution.

4) What is the quantity of water needed for erosion?

The fourth question, “What is the quantity of water needed for erosion?” must now be addressed, and there are many estimates, which vary widely. Planetary scientists do not know how much water was needed. Complicating factors include the existence of a northern ocean, whether floods were catastrophic or not, how much time it took for the carving of outflow channels and VNs, etc.

Estimates of the necessary volume of water range from 3 m to 5,000 m GEL, which indicates the great variety of opinions, models, and uncertainties (Rosenberg et al., 2019). Luo et al. (2017) are at the high end. On the other extreme, Palumbo and Head (2018) and Rosenberg and Head (2015) believe the amount of water needed was only 3 m to 100 m GEL. Carr and Malin (2000) estimated 50 m GEL to carve the VNs (Segura et al., 2002). Rosenberg et al. (2019) determined an intermediate estimate of 640 m GEL. Scheller et al. (2021) believe the amount of needed water for both the outflow channels and VNs ranged from 100 m to 1500 m GEL. The wide range of these estimates reveals that uniformitarian scientists do not know the answer to the fourth question.

The volume largely depends on the type of flooding, which has been determined to be catastrophic. The origin of Kasei Valles, the largest outflow channel, is a case in point. Estimated peak discharges range from 10^4 m³/s to 10^9 m³/s (Carr, 2006, p. 117), depending on the number of events. Although some have suggested Kasei Valles was formed by many floods, others have deduced that it was formed by one to a few very

large floods (Bargrey and Wilson, 2011). Earlier, Robinson and Tanaka (1990) had concluded that Kasei Valles formed in one flood with discharge of 0.9 to 2.3×10^9 m³/sec. The volumes are more problematic in light of evidence favoring groundwater eruption.

The time required to have cut the channels and valleys is also unknown. Some claim 100,000 to 10 million years to form the VNs by slow precipitation (Kamada et al., 2020). Rosenberg et al. (2019) suggest that eight specific VNs could have eroded in anywhere from 8 years to 592 years. So, the mechanism(s) and timing of valley networks, as well as outflow channels, depends upon many variables.

Since greater discharge generates rapid erosion, catastrophic floods indicate the VNs formed rapidly and that the lower estimates of GEL are more likely. Goudge et al. (2018, p. 9) conclude:

“Instead, we conclude that the studied paleolake outlet canyons were primarily incised during *single episodes* of highly erosive lake overflow flooding. This conclusion is also physically intuitive, as the potential energy stored in the lake is available for incision prior to breaching vastly exceeds what can be generated by slower, post-breach outflow, which is inherently bounded by inflow rates and dampened by the storage capacity of the basin itself” (emphasis mine).

Such catastrophic, single-episode floods require less water and time. They also heighten the mystery of the origin of VNs and outflow channels for uniformitarians. Less time points to the alternative Biblical model with its short timescale, which will be presented in Part III.

The Problems with Impacts Causing the Mars Floods

These four questions lead one to ask what the ultimate source of the water

was. At present, answers are very controversial, considering the present cold, dry climate and the main uniformitarian assumptions that it has always been so (Bauley et al., 2016).

One proposal is that impacts caused flooding by creating an ephemeral, warm, wet climate. Segura and colleagues were early advocates of this impact hypothesis (Segura et al., 2002, 2008, 2012; Toon et al., 2010). Heydari et al. (2020, p. 1) also suggest that the mechanism for flooding was a large impact:

“The most likely mechanism that generated flood waters of this magnitude on a planet whose present-day average temperatures is -60°C was the sudden heat produced by a large impact. The event vaporized frozen reservoirs of water and injected large amounts of CO_2 and CH_4 from their solid phases into the atmosphere. It temporarily interrupted a cold and dry climate and generated a warm and wet period.”

Such an impact and its hot ejecta would no doubt melt much subsurface ice if it were present. There could also be some water in the impactors, especially if they were comets. Impacts would add dust/debris to the atmosphere, which would tend to cool it off by reflecting sunlight back to space. Much water vapor would be added to the atmosphere and warm the climate by the greenhouse effect. However, large impacts would add only a little CO_2 and CH_4 to the atmosphere, which some planetary scientists believe is needed for a warm, wet climate. Regardless, water vapor itself is about four times more efficient at trapping heat energy than CO_2 , and it is probable that water vapor is all that is needed to cause a warm, wet climate.

Estimating water produced from a large impact is difficult (Segura et al., 2008). Segura and colleagues estimate that an impactor with a 250-km diameter could produce 50 m GEL of water, the amount some researchers claim is

needed to form the valley networks (Carr and Malin, 2000).

Segura’s 1-D model was much too simple (Steakley et al., 2019). Steakley et al. (2019) used more sophisticated 1-D and 3-D models with impactors up to 100 km and atmospheres up to 2 bars. One impact was insufficient to cause VN erosion by flooding (Steakley et al., 2019, p. 186): “Ultimately, the water and energy delivered by impacts in these scenarios do not result in sustained warm and wet climates.” Although, impacts do not result in a sustained warm, wet climate, a transient warm, wet climate can occur with each impact and last for many years. Precipitation can be quite high the first year, ranging from tens of centimeters to several meters, but tail off rapidly after that with most precipitation as snow.

But Palumbo and Head (2018) indicate that a 100-km diameter impactor would produce only 1 m to 5 m GEL and a 250 km impactor only 10 m to 25 m GEL. Turbet et al. (2020) claim that one very large impact would add about 58 m GEL to the atmosphere with warming for several tens of years. Steakley et al. (2019) claim 640 m to 5000 m GEL is required and that the VNs needed 10^5 to 10^7 years to form. They believe one large impactor could not produce enough water and its effects would be too transient.

To further complicate the idea, Palumbo and Head (2018) claim that precipitation from impacts would be homogenous and inconsistent with the patchy location of VNs. They also do not believe the rainfall would be significant, which they predicted to be 2 m/yr. at the beginning and decrease rapidly. Furthermore, there would be tens of millions of years between impacts.

Turbet et al. (2020) also ran a variety of impact models but with impactors greater than 100 km, which would produce craters greater than 600 km. Some of the impactors would be 200 km to 500 km in diameter and produce

craters 1000 km to 2500 km in diameter, assuming the impactor velocity was only 9 km/s. They obtained similar results as Steakley et al (2019) and discovered: (1) each very large impact causes only 0.1 to 1% of atmospheric erosion; (2) an impact-induced warm climate lasted several tens of years, which they believe is too little time, since VNs supposedly require about a million years to form; (3) about 2.6 m GEL per Earth year of water vapor formed with each large impact; (4) a large impact would cause a hot mantle and crust that would last for millions of years; (5) hot silicate vapor would fall on the surface first; (6) after a short time, hot, intense precipitation would occur. Hot water would erode VNs quicker (Palumbo and Head, 2018).

Turbet et al.'s (2020) scenario is considered unlikely. The hot, intense rain from each impact would last about 12 Martian years (one Martian year equals 1.88 Earth years). After 15 Martian years, the atmospheric temperature would drop below freezing, the event ending with snow. The effects of an impact last only 18 Martian years, and there would be no sustained warm, wet climate. The impact would produce 58 m GEL of precipitation, which is believed to be an order of magnitude too small. The 3-D atmospheric model produces a strong Hadley cell, similar to Earth, in which the atmosphere rises at the equator and sinks at 30° latitudes. So, heavy precipitation would occur near the equator and little precipitation at 30° latitude. The VNs are believed to be predominantly found at 30°S, which creates a problem as to their origin. There is heavy precipitation at high latitudes. Despite impacts not being able to produce a long-lasting warm, wet climate, they do produce an episodic warm, wet climate.

But due to the uniformitarian crater dating, the timing of impacts and VNs varies too much. It appears that the VNs occurred well after major impacting (Toon et al., 2010). Because the uniformitarian impacts are separated

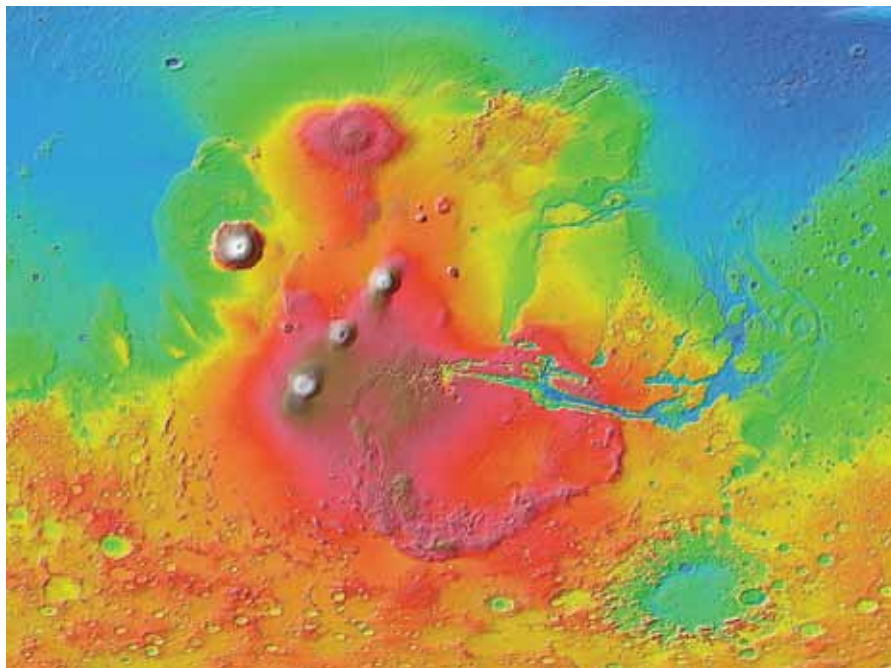


Figure 5. Mars Orbiter Laser Altimeter (MOLA) colorized topographic map of the western hemisphere of Mars, showing the Tharsis volcanic bulge with four distinctive volcanoes, the Valles Marineris region, and the Kasei Valles. The Argyre impact basin is at lower right (NASA). The red, brown, and white colors are high altitude, while the green and blue are lower altitude.

by long periods of time, each impact is thought insignificant.

The Problems with Volcanism Causing the Floods

Volcanism, like the Tharsis volcanoes (Figure 5), could create a warmer, wetter Mars (Samec, 2013; Halevy and Head, 2014; Jakosky, 2021). Strong volcanism can cause warmth and precipitation (Cang and Luo, 2019) since volcanic emissions are about 90% water vapor (Samec, 2013). Scheller et al. (2021) estimated the amount of water from volcanism on Mars could range up to 120 m GEL. If the magma contained even one percent (1%) water vapor, water released to the atmosphere could reach 125 m GEL (Jakosky, 2021).

The 125 m GEL is a maximum since most water would be entrained

in the magma. A more realistic number for water released from extruded lava is less than 15 m GEL; so it is thus unlikely that volcanism caused the floods. Secular scientists spread the volcanic eruptions over billions of years (Milbury et al., 2012; Broquet and Wieczorek, 2019), making each eruption insignificant.

The Tharsis Bulge is believed to have volcanic units of all ages (Johnson and Phillips, 2005), so the 1.5 bars of total CO₂ (Phillips et al., 2001) would be spread over billions of years. A little CO₂ can also be supplied by impacts (Navarro-González et al., 2019). However, CO₂ is a minor gas and researchers have concluded other greenhouse gases are needed. Volcanoes also emit SO₂ that becomes sulfuric acid, which reflects sunlight back to space, probably negating any warming from CO₂.

Volcanoes give off ash and aerosols, especially SO_2 , which will cool the planet by reflecting sunlight back to space, as observed after very large volcanic eruptions on Earth. The ash will fall out in a matter of weeks, but the aerosols would fall out much slower, on the order of years. Such cooling could negate any warming caused by minor gases, except for the water vapor, as described above.

Impacts May Have Triggered Volcanism

Some researchers suggest that impacts triggered volcanism, combining to produce a warm, wet climate. Toon et al. (2012) think the Hellas impact occurred before Tharsis volcanism. It was nearly antipodal to Hellas, suggesting it triggered Tharsis volcanism (Phillips et al., 2001; Faulkner, 2014). Otherwise, the cause of the Tharsis volcanism is unknown. It is believed that seismic energy from a major impact could cause fracturing and surface disruption on the planet opposite the impact, creating structural weaknesses in the area of the Tharsis bulge and its volcanic cones (Spencer, 1994). However, crater dating makes the timing uncertain. Some researchers date the main eruptions as Noachian (Fassett and Head, 2008), but others believe they were late because there are few craters on the Tharsis bulge (Carr, 2006; Bauley et al., 2016).

As an alternative theory, Reese et al. (2002) suggest that Tharsis was caused by an impact-induced thermal anomaly. This connection also suggests that impacts caused volcanism.

From a Biblical perspective, Samec (2013) believes that the volcanism was caused by accelerated radiometric decay during Creation and/or the Flood. This volcanism in turn caused the floods on Mars. Although he ignores impacts, Samec's hypothesis for the volcanism could be true during the time of the Genesis Flood.

Could Impacts and Volcanism Together Cause the Floods?

If impacts and volcanism occurred together, the combination might have created a warmer atmosphere with precipitation (Palumbo and Head, 2018; Steakley et al., 2019; Shi et al., 2022). Carr (2006, p. 130) states: "Most [large flood features] appear to have formed by eruptions of groundwater triggered by impacts, volcanic or tectonic events, or by catastrophic drainage of lakes." Rosenberg and Head (2015) believe that impacts and volcanism melted ground ice to produce VNs. If the flow through the valleys was only $4 \times 10^4 \text{ m}^3/\text{s}$, it would take between a few centuries and 10,000 years to carve VNs (Rosenberg and Head, 2015). Deep time is a problem for uniformitarians, however. Spacing out impacts and eruptions over long ages would not allow for needed climate changes and flooding.

Glaciation

Impacting models show that the atmosphere would cool rapidly afterwards. The last stage of an impact would be snow (Segura et al., 2008), beginning at high latitudes and spreading toward middle latitudes. Along with the 2 km-to-4 km-thick polar ice sheets, ice could have also accumulated at mid-latitudes, based on various observed ice flow features. Ice is pervasive at the surface and in the subsurface from 35°N to 78°N (Ramsdale et al., 2019).

Was ice mostly in soil pores and ice lenses in the soil (Sizemore et al., 2015)? Evidence of clean ice occurs in the walls of new impact craters at mid-latitudes (Byrne et al., 2009; Dundas et al., 2014.). Ice has been observed to be at least 100 m thick at eight scarp locations in the mid-latitudes (Dundas et al., 2018). That which exists between 30° to 50° is unstable in the present climate, but does not sublimate, thanks to a thin covering of wind-blown sediment or regolith debris as shown in Figure 6 (Hepburn

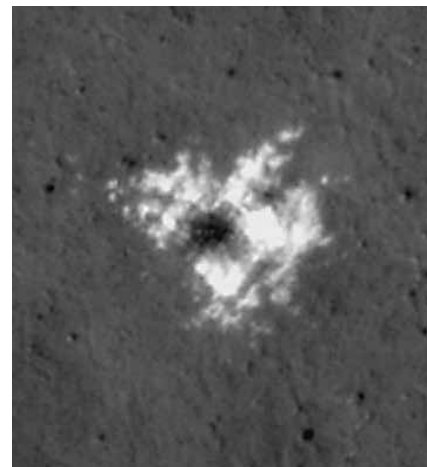


Figure 6. A fresh impact crater exposing water ice in the white area below the regolith (NASA/JPL-Caltech/University of Arizona).

et al., 2020). The origin of this clear ice is unknown, but it must have formed by snowfall in a much different climate (Mischna, 2018).

The amount of ice in the subsurface has recently been established, which heightens the mystery of the origin of the snow. Based on a dielectric constant of the subsurface of 2 to 3, mid-latitude ice is probably 300 to 600 m thick (Campbell et al., 2021). Moreover, it is clean ice that resulted from snow and not thick, ice-rich regolith (Dundas et al., 2021).

The ice is dated as Amazonian (Table I) because of a lack of impact craters (Sinha and Ray, 2021), which places it well after impacts and volcanism. But there is a more logical association between glaciation and the formation of VNs and outflow channels. This suggests impacting occurred quickly, creating conditions for rapid flooding. It would also indicate that the crater dating system is flawed.

Given late Amazonian dates for mid- and high-latitude ice, including the polar ice sheets, planetary scientists

have devised a theory that at high obliquity, ice is transferred from the polar ice sheets to the mid-latitudes and/or equatorial regions by sublimation over tens of thousands of years (Bramson et al., 2017). When the obliquity becomes low again, mid-latitude and/or equatorial ice sublimates and condenses on the polar ice sheets. But this does not explain the *origin* of the ice, estimated at 20 m–40 m GEL.

Numerous Periglacial Features

With so much subsurface ice at mid- and high-latitudes, there are widespread periglacial features (Sizemore et al., 2015). For instance, a polygonal-patterned surface is common in the northern lowlands as shown in Figure 7 (McEwen et al., 2007). It is likely that pingos also occur (Soare et al., 2021). Pingos are conical, ice-cored hills that form in permafrost and range in height on Earth from 3 m to 70 m and in diameter from 30 m to 1,000 m (Figure 8).

Summary

The floods of Mars bring up six major questions. Three of them were answered in this part: 1) the floods were the result of water; 2) the floods were catastrophic; and 3) both groundwater and rainfall runoff were the cause of VNs. The answer to Carr and Malin's (2000) third question: "What is the ultimate source of the water?" was left unanswered. The current suggestions are impacts and/or volcanism. The fourth question: the estimated amount of water varied considerably, from 3 m to 5000 m GEL, showing the wide range of assumptions and uncertainties. The uniformitarian scenarios are left with problems, opening the door for a Biblical explanation. One will be developed in Part III, which will also answer the remaining questions of Carr and Malin (2000).

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Figure 7. Polygonal patterned ground on the floor of a trough in the Southern Hemisphere of Mars from Mars Global Surveyor MGS Mars Orbiter Camera MOC (NASA/JPL/Malin Space Science Systems).



Figure 8. View from top of a pingo towards another pingo with the Arctic Ocean in the background, near Tuktoyaktu, Yukon Territory, Canada (Matti & Ketii, Wikipedia Commons CC-BY-SA-4.0).

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CRS Grants for Creation Research

Each year the National Science Foundation (NSF) distributes billions of dollars to support scientific research. This funding has catalyzed the development technologies we now take for granted—smartphone screens, weather radar, etc. Unfortunately, agencies like the NSF suffer from a major limitation—namely, the naturalistic worldview that dominates academia. Because of this presuppositional blind spot, they do not fund creation research.

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

Some things to keep in mind:

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

Here is the process:

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

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

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



Crassostrea Oyster Fossils Show Evidence of Extreme Longevity

Jake Hebert, Richard Overman, Frank J. Sherwin

Abstract

This paper presents evidence that fossil *Crassostrea* oysters experienced much greater longevity than their modern-day descendants. For extant animals, multiple studies have revealed a positive correlation between longevity and adult body size: the larger the organism's size as an adult, the longer its lifespan. Studies have also demonstrated that organisms that take longer to reach skeletal and/or sexual maturity also tend to have longer lifespans. Fossil *Crassostrea* oysters are generally larger than their modern-day counterparts, and ontogenetic growth curves suggest longer lifespans and generally longer growth intervals. This evidence should be of great interest to Biblical creationists in light of the Bible's claim that humans in the pre-Flood and immediate post-Flood worlds experienced much greater longevity than modern-day humans. Animals may also have once experienced greater past longevity, since whatever genetic or environmental factors were enabling extreme human longevity were likely also operating across the animal kingdom.

Key Words: antediluvian, bivalves, *Crassostrea*, fossils, giantism, growth bands, longevity, oyster, sclerochronology

Introduction

One of the claims in Scripture that is most ridiculed by skeptics is the Bible's matter-of-fact declaration that, in the pre-Flood world, humans routinely attained ages in excess of 900 years (Genesis 5). Even for some time after the Flood, humans were experiencing lifespans of about 400 years (Genesis 11:12–17),

which eventually dropped to 200 years (Genesis 11:18–32), and then gradually decreased to the 70–80 year average lifespan at the time of Moses (Psalm 90:10). Such extraordinary centuries-long lifespans are far beyond our present-day experience. Hence, creationists should be interested in possible corroboration of the Bible's claim in this regard from

historical or paleontological data. Previous creationist authors (Patten, 1982; López, 1998) have discussed possible historical and cultural confirmations of these vast ages. Others have discussed possible evidence of greater longevity in post-Flood Neanderthal fossils (Cuozzo, 1998), as well as a possible connection between greater longevity and past giantism (Patten, 1982; Beasley, 1990; Nelson, 2017).

Crassostrea virginica (Figure 1), also known as the Atlantic or East Coast Oyster, is capable of attaining ages of 20 years with adult sizes of up to 8–10 inches, or 20–25 cm (Wallace, 2022;

Anonymous a). However, these seem to be exceptional values, with most lifespans and sizes being much less than these (Osborne, 1999). Other sources (Harzhauser et al., 2016; Kusnerik et al., 2018) list the maximum lifespan as between 5 and 10 years, and the AnAge Animal Ageing and Longevity Database (de Magalhães, 1997) lists the lifespan for wild *Crassostrea virginica* oysters as 5 years. They are prized as a seafood, but there is another reason for creationists to love *Crassostrea* oysters: *Crassostrea* fossils provide evidence that they were experiencing much greater longevity compared to modern *Crassostrea* oysters, and they provide an important link suggesting that this was also true for other animal forms. This paper expands on the brief discussion presented by Hebert (2023).

Background: Asymptotic Growth and the von Bertalanffy Growth Equation

Many animals exhibit asymptotic growth; that is, as they mature, their length L asymptotically approaches a maximum value that we designate as L_∞ (Figure 2). This asymptotic growth can be described mathematically by the von Bertalanffy (1938) growth equation:

$$L(t) = L_\infty \left(1 - e^{-k(t-t_0)}\right) \quad (1)$$

Here, t is the time since birth (measured in years) and k is a parameter (with units of years⁻¹) that governs the relative speed with which an organism reaches adulthood. Although k is not a growth rate *per se*, it is a proxy for growth rate, with high k values representing faster growth and lower k values representing slower growth.

The value t_0 is the (theoretical) time at which the organism's length is zero. If the animal has zero size at birth, t_0 will be zero. If the creature has a positive, non-zero size at birth, t_0 will be a negative number, indicating that the creature

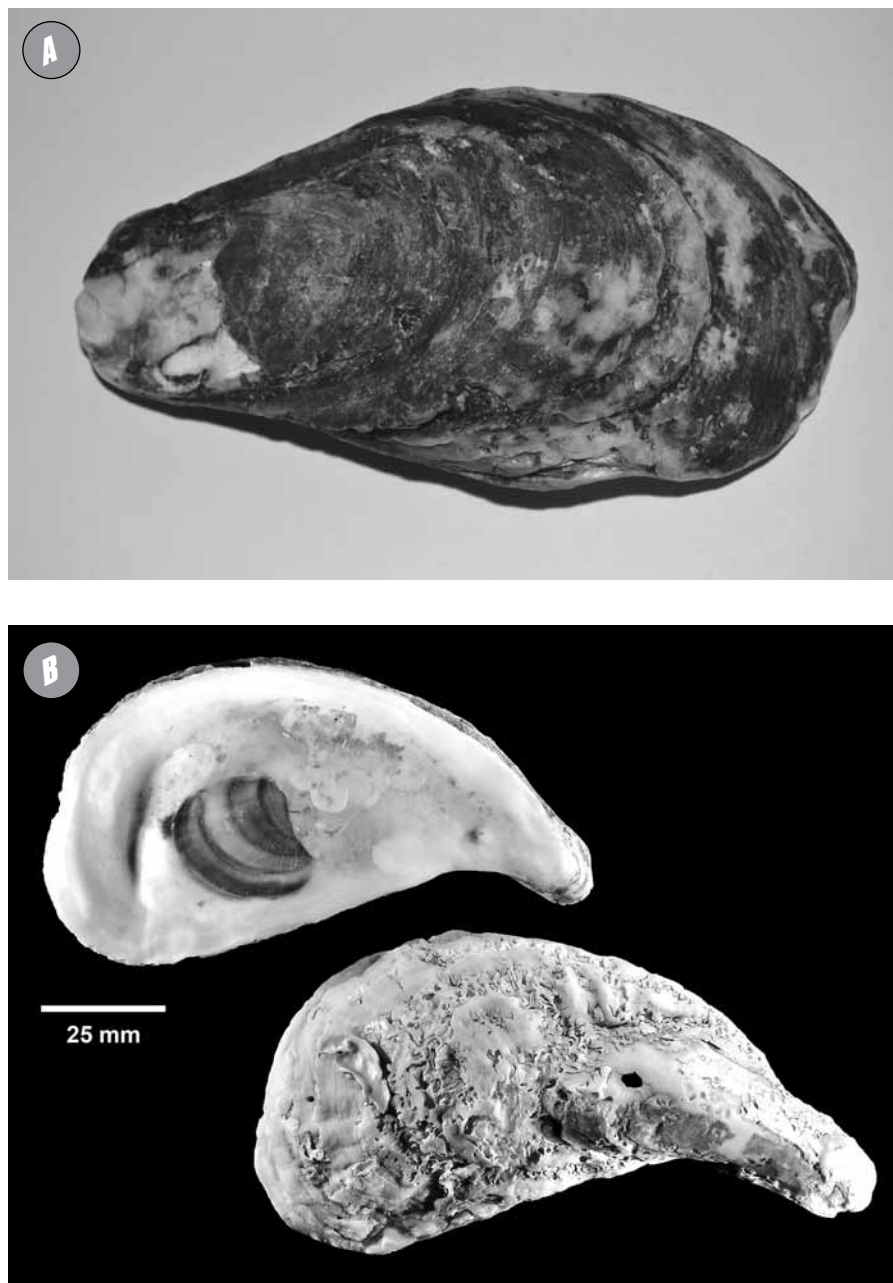


Figure 1. The oyster species *Crassostrea virginica*, or Eastern Oyster. Figure 1a by Andrew C, Creative Commons Attribution 2.0 Generic license. Figure 1b by Eric A. Lazo-Wasem, Yale University Peabody Museum. Creative Commons CC0 1.0 Universal Public Domain Dedication.

had zero size at the beginning of its gestation, $-t_0$ years before birth.

Theoretically, Equation (1) describes indeterminate (never-ceasing) growth, since for any finite time t the organism's

growth never quite stops. As a practical matter, however, Equation (1) is often used to model both indeterminate and determinate growth, since one can treat the age at skeletal maturity t_{mature} as the

time at which the slope of the function becomes arbitrarily small.

Day and Taylor (1997) have criticized use of Equation (1), arguing that two separate equations are needed to accurately model growth, one for younger ages and a second for older ages. Nevertheless, the von Bertalanffy equation is routinely used by commercial fisheries to estimate age-size relationships for fishes, and it is the growth curve most often used for bivalves (Moss et al., 2021).

Eq. (1) is obtained from a population of organisms. L_{∞} thus represents the average adult body size for the population, obtained from fitting a growth curve to the size-versus-age population data. Since this is a population average, individual specimens in the population will be characterized by L_{∞} values that are both smaller and larger than this.

Given sufficient time, the growth rate of an organism exhibiting *determinate* growth will become vanishingly small when it reaches skeletal maturity at time $t \approx t_{mature}$. At this time, the slope of the growth curve approaches zero. Note that t_{mature} is not necessarily the same as the age t_{sex} at sexual maturity, as ages at sexual maturity do not necessarily coincide with ages at skeletal maturity. Indeed, *Crassostrea virginica* can reach sexual maturity soon after hatching (Anonymous a), although it continues to grow for much longer than this. Nevertheless, one might reasonably expect higher ages t_{mature} at skeletal maturity to be associated with higher ages of sexual maturity t_{sex} . These points will become important later in our discussion.

Longer Childhood, Longer Life?

Although longevity is influenced by multiple factors, greater longevity in extant creatures has repeatedly been shown to be positively correlated with greater values of t_{mature} . In a study of 124 terrestrial vertebrate taxonomic families, including birds, mammals, reptiles, and

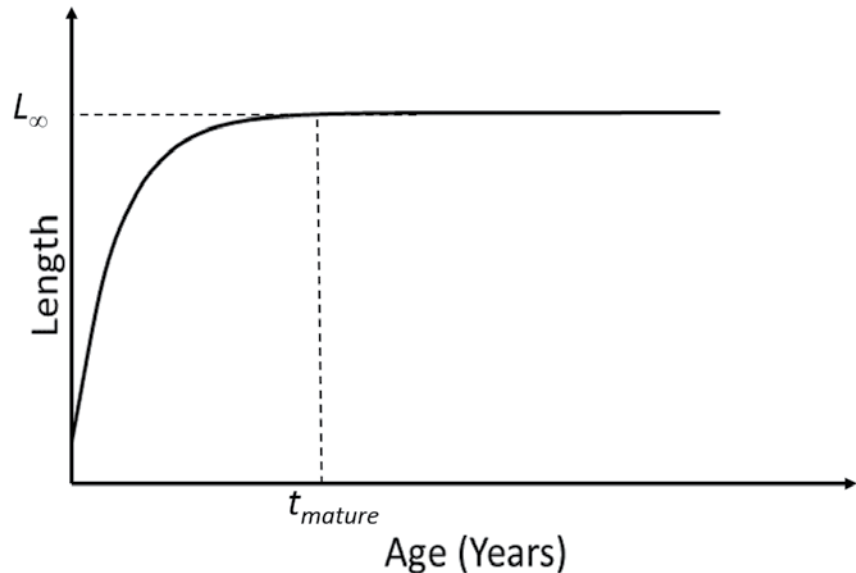


Figure 2. The von Bertalanffy growth curve, showing the increase of an organism's length or height as a function of time since birth or hatching. Note that growth effectively, if not completely, stops, when the organism reaches adulthood at time t_{mature} .

amphibians, Ricklefs (2010a) showed that the rate of aging decreased with a number of factors, two of which were increasing gestation period and age at maturity. He also showed that the rate of aging in birds decreased with increasing length of embryonic development. Naturally, one would expect a decreased rate of aging or senescence to imply greater longevity. In order to better ensure that the data met the requirements for a linear least-squares regression, Ricklefs log-transformed his data before performing his correlation, a common practice in such studies. A second study (Ricklefs, 2010b) of 36 bird species and 18 mammal species found that longer embryonic growth rates were positively correlated with decreased rates of aging for both birds and mammals.

A study of 1456 mammals, birds, amphibians, and reptiles (de Magalhães et al., 2007) showed that age at maturity is positively correlated with maximum adult lifespan. They also showed that

postnatal growth rates were inversely correlated with adult lifespan: the faster an organism reached maturity, the shorter its life. Their analysis used a technique called 'phylogenetic independent contrasts' (PIC), which assumes the validity of evolutionary theory. Hence, this may have prejudiced their results by evolutionary assumptions. However, they obtained statistically significant results, both with and without the use of PICs.

Particularly relevant to this study, since we are discussing the molluscan bivalve genus *Crassostrea*, researchers have repeatedly shown that age at sexual maturity in bivalve mollusks is positively correlated with greater longevity. One particular bivalve, the ocean quahog (*Arctica islandica*), is the longest-lived molluscan species on Earth (Abele 2008), with a life-span of ~400 years, and even 500 years. Abele et al. (2009) summarize the commonalities previous researchers have observed in extremely long-lived bivalves:

Extremely long-lived bivalves share common and characteristic life history features. The first is an *extremely slow and seemingly indeterminate growth* in Arctic and Subarctic climates, compared to sympatric species from warmer habitats....A second is the *late onset of reproduction* which then continues into old age without a post-reproductive phase. [emphases ours]

In today's world, very slow growth and increased lifespans in bivalves are associated with very cold climates and low and seasonal food availability (Palmer et al., 2021). But if slow growth and delayed reproduction were induced for some other reason or reasons, might they still be associated with extreme longevity?

Ridgway et al. (2011) showed a statistically significant positive correlation between the natural logarithm of bivalve adult life span and the natural logarithm of bivalve age at sexual maturity, as well as a statistically significant negative correlation between the natural logarithm of maximum species age and the natural logarithm of the Bertalanffy growth coefficient k . For eight bivalve orders, Moss et al. (2016) also found a statistically significant negative correlation between the logarithm of bivalve lifespan and the logarithm of the von Bertalanffy growth coefficient k .

However, because these studies often involved creatures from different genera, one might perhaps worry that these results only hold when one is comparing lifespans of creatures belonging to different Genesis baramin or 'kinds.' It is well-known that larger, more massive animals (such as elephants) tend to live much longer than smaller, less massive animals (such as shrews). In fact, biologists have long noted that biological timescales, such as lifespan, time to sexual maturity, blood circulation time, etc. are generally proportional to the organism's mass raised to the $\frac{1}{4}$ power (Lindstedt, 1981; Calder, 1984; Schmidt-Nielsen,

1986). Hence, one would expect more massive species of animals to have longer lifespans and to take longer to reach maturity than less massive species.

But is this merely an inter-species or inter-genera result? Does greater longevity also positively correlate with t_{mature} or with t_{sex} within a single 'Genesis kind'?

Although not as abundant as the evidence cited above, there is some evidence that it does. Most creationists would probably agree that, in general, two species belonging to the same genus are members of the same Genesis kind, even if they have been assigned different species names (Woodmorappe, 1996). A study (Genade et al. 2005) of two fish species of the genus *Nothobranchius* showed that a *Nothobranchius* species (*N. Kunthae*) taking longer to mature lived much longer than the *Nothobranchius* species (*N. furzeri*) that matured more quickly (see especially Figure 5 in Genade et al., 2005).

In a study of three-spined stickleback fish (*Gasterosteus aculeatus*), Lee et al. (2013) found statistically significant positive correlations between pulses of accelerated/slowed growth and decreased/increased longevity. The 2013 study by Lee et al. is particularly noteworthy because it was apparently the first rigorous *experimental* confirmation of an inverse relationship between growth rate and longevity, as it controlled for the effects of food supply and final adult size:

We used brief (less than 4% of median lifespan) exposure to relatively cold or warm temperatures in early life to deflect juvenile three-spined sticklebacks *Gasterosteus aculeatus* from their normal growth trajectories; this induced catch-up or slowed-down growth when ambient temperatures were restored, and all groups attained the same average adult size. Catch-up growth led to a reduction in median lifespan of 14.5 per cent [sic], while slowed-down growth extended lifespan by 30.6 per cent [sic]. These lifespan effects

were independent of eventual size attained or reproductive investment in adult life.

In this study, the fish all took the same total amount of time to reach maturity, but those experiencing the accelerated catch-up growth had shorter lifespans. It should be noted that both the three-spined stickleback and the freshwater killifish (like *Nothobranchius* fishes) are often seen as "model systems" for studying vertebrate biology due to a number of factors, including their small body size, short reproduction times, and high fecundity (Reichard and Polačik, 2019; Reid et al., 2021).

Also, Tabatabaie et al. (2011) found that long-lived Ashkenazi Jews were older at first childbirth, suggestive of delayed sexual maturation. However, this last line of evidence is less convincing, due to the many variables that can affect human lifespan.

Delayed Maturation of the Genesis Patriarchs?

In light of these observations, it is striking that the earliest age at which a Genesis 5 patriarch is listed as having a son is 65 (Genesis 5:15, 21). Granted, many of these sons may have not been firstborn, but at least some of them probably were. Given the strength of the human sex drive, it seems very unlikely that the Genesis patriarchs were all becoming sexually mature at 15 or 16 and yet were all deciding to postpone sexual relations for fifty years! It seems far more likely they were becoming sexually mature at much greater ages than do humans today, as suggested by Patten (1982) and Beasley (1990). Thus, the greater ages at sexual maturity recorded in Genesis are consistent with expectations from numerous longevity studies: one would expect very long-lived humans to have longer periods of growth than humans with much shorter lifespans. The same is true for the ages of the patriarchs listed in Genesis 11. The earliest age at which

a Genesis 11 patriarch is listed as having a son is 29, and most of these listed ages cluster between 30 and 35. Chances are that at least one of these listed sons was a firstborn. By today's standards, 29 or 35 is rather late in life to have a firstborn son.

Whatever conditions in the pre- and immediate post-Flood worlds (lower genetic mutational loads, somewhat higher atmospheric oxygen content, abundant food, etc.) were allowing humans to achieve longer lifespans, those same conditions would likely have also applied to the animal kingdom. Thus we should not be surprised if the fossils themselves provide evidence of much greater animal lifespans than at present.

The Bigger They Are... the Longer They Live?

Studies have shown that larger adult body sizes (larger values of L_∞) are positively correlated with greater longevity (de Magalhães et al., 2007; Wasser and Sherman, 2010; Ricklefs, 2010a; Ridgway et al., 2011). However, there is conflicting evidence in the case of bivalve mollusks. In their study of 56 bivalve species, Ridgway et al. (2011) found a weak but statistically significant ($p = 0.004$, 95% level) positive correlation between the natural logarithm of L_∞ and the natural logarithm of maximum age. However, a larger study by Moss et al. (2016) did not find such a correlation, although Moss et al. did find a positive correlation between t_{mature} and total longevity.

Holm et al. (2016) found that within the family *Geometridae*, larger moth species tended to live longer than smaller ones. However, it is not clear if this study was free of possible evolutionary assumptions, as this study too made use of phylogenetic independent contrasts (PICs).

The above size-longevity studies compared creatures across 'higher' taxonomic categories, such as classes, orders and families. Thus, the creatures

compared often came from different Genesis kinds. Of much greater interest to us are results from within a particular Genesis kind, or baramin. Intra-specific studies by definition are confined to a single baramin, and intra-generic studies are almost certainly confined to a single baramin. However, such intra-specific and intra-generic studies are much less abundant, and results are conflicting. See Marchionni et al (2019) for a review of results from both inter-specific and intra-specific non-creationist longevity studies, including human studies. However, in Sato's (1994) study of six modern *Phacosoma japonicum* (since reclassified as *Dosinia japonica*) bivalve assemblages, larger body size was consistently associated with greater ages at sexual maturity and maximum observed ages (see Table I), although Sato did not perform a statistical test. Given that greater ages at sexual maturity are often linked with greater longevity and greater size in bivalves, this may be indirect evidence of an intra-species size-longevity connection. Moreover, we shall see in the following sections examples in which (apparently) long-lived fossil oysters are indeed larger than their shorter-lived fossil and modern-day counterparts.

Moreover, there are reasons to suspect a positive correlation between longevity and higher values of L_∞ , even within a baramin. As noted earlier, it has long been observed that biological timescales tend to be proportional to an organism's mass raised to the $\frac{1}{4}$ power. Consistent with this general result, West et al. (2001) have presented a theoretical justification for expecting an organism's adult body mass M to be proportional to its age at maturity t_{mature} raised to the fourth power:

$$M \propto t_{mature}^4 \quad (2)$$

Of course, higher values of L_∞ naturally imply higher adult body masses M . Since we have intra-genera experimental justification (Sato, 1994; Genade

et al., 2005; and Lee et al., 2013) for expecting delayed maturation (greater ages at maturity) to positively correlate with greater longevity, Eq. (2) implies that we might also expect greater adult body mass M to be positively correlated with greater longevity, as well.

A weakness in this chain of reasoning, however, is that the result of West et al. (2001) does not explore the effect that a change in environmental conditions might have upon longevity within a taxon. In other words, adult body mass within a taxon depends upon age at maturity, but it likely also depends upon factors such as oxygen availability, nutrient availability, etc. These are factors which could conceivably have changed between the pre- and post-Flood worlds. Changes in these variables could conceivably attenuate and/or obscure the general result implied by Eq. (2).

There is another reason to suspect a positive correlation between greater longevity and larger adult body size (higher values of M and L_∞). If one considers Figure 2, t_{mature} may be increased by proportionally "scaling up" the size of the organism's growth curve without changing its general shape. Doing so forces t_{mature} to become larger as L_∞ becomes larger. Since there is some intra-genus evidence (Sato, 1994; Genade et al., 2005; Lee et al., 2013) that t_{mature} is positively correlated with greater longevity, and since one way (but admittedly not the *only* way) to increase t_{mature} is to increase the organism's adult body size L_∞ , we might also expect greater longevity to be associated with greater adult body size.

Counterexamples

Of course, there are counterexamples to both trends. In a summary of other studies, Marchionni et al. (2019) noted that body masses of mice, horses, dogs, and humans are usually negatively correlated with longevity in intraspecies studies. However, at least in the cases of

dogs and horses, some of this could be the result of inbreeding.

Likewise, Miller et al. (2002) found that two out of three wild-derived mice strains were smaller and experienced delayed sexual maturity compared to laboratory strains of mice, yet the wild mice strains were generally longer-lived. They also found that females of these two longer-lived wild strains were also slower to reach sexual maturity. Miller et al. speculated that these results may be due to inbreeding of laboratory strains. So in this particular case, the results were mixed.

Mueller and Mazur (2009) and Samaras (2014) found that greater body size and height were positively correlated with increased human mortality. On the other hand, Brandts and van den Brandt (2019) found a positive correlation between height and longevity for women in the Netherlands but not for men. Given that, as of June 2023, the Dutch people are the tallest in the world (Bostock and Ankel, 2023), this result is intriguing. On the other hand, a very large study (Wormser et al., 2012) found that greater height was associated with a greater risk of cancer but a decreased risk of coronary heart disease and stroke. However, given the multiple factors that can influence human longevity, these results are probably not conclusive, and even the positive results by Tabatabaie et al. (2011) discussed previously should be viewed with some skepticism. Results from experiments under carefully controlled conditions using “model” laboratory animals, like those obtained by Lee et al. (2013) are probably more reliable.

Although it might perhaps seem obvious, it should be noted that body size (specifically, body mass) does not explain *all* intraspecies and interspecies variation in longevity—it explains much of the variation, but not all of it. For instance, one might naively expect a gorilla (average adult body mass greater than 110 kg) to have a longer lifespan than a human (average adult body mass

of 60–80 kg). Yet humans, with their lifespans of around 70–80 years, generally live longer than gorillas (~50 years). So although these trends are real, factors other than mass clearly also influence longevity.

A Working Hypothesis... and Predictions

Despite the existence of some contrary data, we assume as a working hypothesis that organism longevity is indeed positively correlated (Figure 3) with both age at maturation t_{mature} and adult body length or height L_{∞} . In the absence of a fully-developed theory of longevity, it may not be possible at this time to make an airtight argument for the validity of these assumptions. Nevertheless, they are reasonable. Note also that we are *not* at this time attempting to explain the *cause* of these correlations; we are simply accepting them as valid empirical results.

This enables us to make predictions about trends we should see in *Crassostrea* fossils. We expect fossil *Crassostrea* oysters to generally show either indirect or direct evidence of greater longevity than modern *Crassostrea* oysters: larger body sizes and indications of delayed maturation (Figure 2), as well as greater estimated ages at time of death, based on sclerochronological data, discussed in more depth below.

Two of us (Hebert and Sherwin) think evidence for a “high” Cenozoic Flood/post-Flood boundary is overwhelming (Holt, 1996; Oard, 2002a, 2013; Clarey, 2019; and Clarey, Werner and Tomkins, 2022), while the third (Overman) does not have a strong opinion. However, the results of this analysis do not necessarily depend upon the precise location of the Flood/post-Flood boundary. From Scripture, we know that human lifespans decreased dramatically after the Flood and continued to decrease in the following centuries. Hence, we should not be surprised if animal lifespans in general, and *Crassostrea* lifespans in

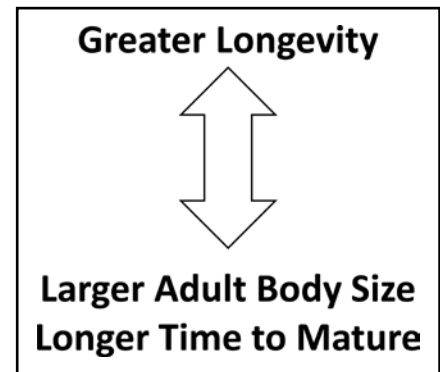


Figure 3. Longevity studies have shown that greater longevity is associated with larger adult body sizes and longer maturation times.

particular, experienced a similar decline. For instance, suppose some *Crassostrea* fossils are found within Pliocene rocks. Regardless of whether one dates Pliocene rocks as Flood or post-Flood, if Pliocene rocks date from no more than several hundred years after the Flood, we should expect Pliocene *Crassostrea* lifespans at a particular location to be greater than those of extant oysters, also from that same location, within the same Genesis kind. This is because *both* pre-Flood and post-Flood human lifespans in the centuries immediately after the Flood were much greater than they are today, and the same would likely be true for animal lifespans.

Complications to Consider

There are complications that should be taken into consideration before doing such a study on bivalves. Bivalve longevity is greatly influenced by factors such as water temperature, with bivalves living in very cold high-latitude waters demonstrating extreme longevity compared to those in warmer, lower-latitude waters. Growth in living *Crassostrea* specimens is influenced by temperature, salinity, water current velocity, and availability of

phytoplanktonic food supply (Kirby and Jackson, 2004). Oysters often colonize together in beds, and crowding is also apparently a factor. According to some online sources, (Osborne, 1999; Wallace, 2022), uncrowded *C. virginica* oysters can live as long as 20 years. However, other sources list the lifespan for extant *C. virginica* as much closer to 5–10 years (Harzhauser, 2016; Kusnerik et al., 2018).

It is not possible to completely eliminate the influence of such factors, but we need to minimize their influence as much as possible. Hence, any comparison of modern and fossil bivalve longevity should preferably be restricted to a single location, or to locations very close to one another geographically. At an absolute minimum, the comparison should be restricted to modern and fossil assemblages found within a relatively narrow latitude band. Since we will be comparing late Cenozoic fossil assemblages to modern ones, both creationists and evolutionists would agree that the latitudes of late Cenozoic fossil assemblages would have changed only a little since the time the fossils were formed, regardless of whether one holds to traditional or catastrophic plate tectonics. However, even restricting the analysis to a narrow latitude band does not necessarily eliminate the effects of different water temperatures, for reasons explained later.

Taxonomists have assigned multiple species to *Crassostrea*, but taxonomists have a well-known tendency to ‘oversplit’ when classifying organisms, and creationists have long pointed out that creatures within the same genus probably belong to the same Genesis kind (Woodmorappe, 1996), even if they have been classified as different species. Hence, comparisons of different *Crassostrea* species within the genus are still likely to represent valid comparisons within a single Genesis kind. In fact, as we discuss later, even some evolutionists have suggested that modern *Crassostrea* oysters are direct descendants of much

larger (and apparently much longer-lived) fossil *Crassostrea* forms.

This paper presents evidence that *Crassostrea* longevity was once much greater in the past. However, in order to understand the results, a brief introduction to the field of sclerochronology is in order.

Sclerochronology: An Introduction

Sclerochronology is the study of features such as chemical and periodic structures in the skeletal portions of animals that grow by accretion (layering), such as bivalves (Killam 2018, p. vi):

Bivalve shells contain growth lines which are formed as a result of periodic environmental or physiological stress, analogous to tree rings. The study of these regular growth increments in the hard parts of bivalves and other calcifying organisms is called Sclerochronology

The field has been widened to include the study of periodic bands in numerous aquatic and terrestrial taxa, including coralline algae, fish and gastropods (Jones et al. 1989).

Evolutionary scientists think (Trofimova et al. 2020, p. 2) “the full potential of sclerochronology has yet to be realized.” Moss et al. (2021, p. 1) stated:

Not only can sclerochronological data help to address long-standing questions in paleobiology, but they can also bring to light new questions that would otherwise have been impossible to address. For example, growth rate and life-span data, the very data afforded by chronological growth increments, are essential to answer questions related not only to heterochrony and hence evolutionary mechanisms, but also to body size and organism energetics across the Phanerozoic.

We agree with evolutionary scientists that sclerochronology has untapped potential, but for different reasons. We think it can assist in determining the

effects of the Flood thousands of years ago and up to recent times. We see this field as helping to determine faunal periodic structures—and lifespans—in the pre-Flood and post-Flood worlds. As noted in the above statement by Killam, sclerochronology is much like dendrochronology, and, like dendrochronology, caution should be employed when evaluating data.

Wide bands in mollusk bivalve shells are produced during times of rapid growth, and narrow bands are produced during times of reduced growth. These times of growth reduction or cessation are thought to coincide with physiological stress (Buick and Ivany, 2004). These bands may occur at different times of the years for the same mollusks in different settings (Moss et al., 2021; Jones and Quitmyer, 1996).

It has long been known (Jones, 1981) that not all bands in a mollusk shell are annual. Moss et al. (2021) note that periodic lines in shells have been shown to be tidal, daily, fortnightly, monthly, and annual. Some bands, called *disturbance lines*, can result from storms or attack by predators (Moss et al., 2017).

External bands on the outside of a bivalve shell (or valve) are often disturbance bands, and counting them can lead to erroneous age estimates (Moss et al., 2017). Internal growth bands are thought to be more accurate proxies for age, and these are observed by cutting open the valve in cross-section (Moss et al., 2017).

Can We Trust the Band Counts?

This raises an extremely important question: can bivalve annual band counts be trusted? Creationists are generally distrustful of claims that dendrochronology can provide accurate timelines going back thousands of years (Woodmorappe, 2003; Hebert, Snelling, and Clarey, 2016; Woodmorappe, 2018). If creationists accept these oyster band counts as

being reasonably accurate, are we being inconsistent?

Due to uncertainties about the past, it would be a mistake to put unqualified trust in this or any other such counting method. However, for the following reasons, we can be reasonably confident that these band counts are legitimate, albeit imperfect, proxies for age.

Due to its importance to the seafood industry, modern *Crassostrea virginica* lifespans are likely well-established by direct observation. This gives us additional confidence that, in the analysis below, the ages inferred from sclerochronological analysis of modern *Crassostrea virginica* specimens are reasonably accurate. And in the case of *Crassostrea* oysters, we are not attempting to count thousands, or even hundreds, of presumed annual bands, as is the case for ice core and tree ring dating. Rather, we are attempting to count, at most, a few dozen such bands. Moreover, our analysis does not depend upon the problematic process of ‘cross-matching’ banding patterns in one oyster assemblage to those in another (Woodmorappe, 2003, 2009, 2018).

Also, disturbance bands are not likely to be mistaken for periodic bands, due to their random nature (Moss et al., 2017). Moreover, in the case of *Crassostrea* oysters, Zimmt et al. (2019) identified subtleties in band appearance that can be used to distinguish annual bands from non-annual bands. Moss et al. (2021) noted that annual growth bands are found in almost all extant bivalves outside the tropics, forming in response to seasonal extremes in variables such as temperature, salinity, and food availability. Moss et al. (2017, p. 367) state that annual bands are “unambiguous” if formed in a highly-seasonal environment.

Geochemical Variations Can Aid In Counting

Moreover, geochemical variations may help identify seasonal patterns, even

when those seasonal variation is not as pronounced, as they can serve as a “check” on annual band counts (Moss et al., 2021, p. 3):

Without independent temporal calibration, the assumption that growth bands are annual is not always a safe one—in some cases, visible growth increments bear no clear relation to intra-annual environmental variation. *Geochemical variation along the axis of growth, however, often provides a means by which to confirm the timing of visible growth bands and reveal the annual cycle*, thereby allowing calculation of growth rates and/or determination of ontogenetic age. [emphasis ours]

Geochemical variation refers to changes in a quantity like the oxygen isotope and carbon isotope ratios ($\delta^{18}\text{O}$ and $\delta^{13}\text{C}$, respectively). Although creationists have been skeptical of the level of climate detail that mainstream paleoceanographers claim to be able to infer from ancient oxygen isotope ($\delta^{18}\text{O}$) values (see Oard 1984, Vardiman 2001, Oard 2003, and Hebert 2021 for a discussion), we acknowledge that $\delta^{18}\text{O}$ values are rough proxies for temperature, provided that the shell from which the $\delta^{18}\text{O}$ values are obtained was formed in isotopic equilibrium. This assumption would likely break down during the Flood itself, potentially invalidating the interpretation of the very last band or bands that might have formed during the Flood. However, this assumption would likely have been valid in the pre-Flood and post-Flood worlds. Therefore, if seasonal variation was present in the pre-Flood world, even if less pronounced than today, variations in $\delta^{18}\text{O}$ values within bivalve shells could help identify annual bands within those pre-Flood bivalves. The same would likely be true for the post-Flood world.

Moreover, the use of $\delta^{18}\text{O}$ variations as a “check” on annual counts within a shell does *not* require a precise climatic interpretation of those variations. Since

only observation of repeating maximum and minimum $\delta^{18}\text{O}$ or $\delta^{13}\text{C}$ values is required for this purpose, this avoids the potential perils of attempting to deduce precise climate information (Moss et al., 2021), which requires unprovable assumptions about the past (Oard, 1984; Hebert, 2021).

Indeed, Kirby (2000) demonstrated that annual *Crassostrea* bands can likely still be resolved, even when seasonal isotopic variation is less pronounced:

$\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ profiles across skeletal growth increments in two well-preserved [North Carolina Late Oligocene] *C. gigantissima* shells show significant differences with profiles from Pleistocene and Recent *C. virginica* [from Chesapeake Bay and the Mississippi Delta]. Significantly higher $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ values and smaller seasonal isotopic ranges with less variability show that *C. gigantissima* lived in a more fully marine environment than *C. virginica*.

In passing, it should be noted that this is not the only possible interpretation of the data. It may be that *C. gigantissima* simply lived in an environment with less-pronounced seasonal differences than *C. virginica*, an intriguing possibility in light of creationist suggestions that seasonal extremes were less-pronounced in the pre-Flood world (Whitcomb and Morris, 1991), and that even the post-Flood Ice Age climate was relatively equable (Oard 1990, 2005). Kirby found that over eight apparent growth cycles, $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ minima coincided, but the maxima were slightly offset.

Other studies have demonstrated the usefulness of geochemistry in identifying annual bands. Buick and Ivany (2004) found that for *Cucullaea raea* bivalves from Antarctica, troughs in $\delta^{18}\text{O}$ values consistently coincided with narrow bands corresponding to times of growth reduction or cessation, and this pattern held for 17 such growth cycles. These growth cessation bands were visible to the naked eye, with widths on the order

of 0.25 mm thickness. The intervening bands corresponding to times of growth were usually about a millimeter wide. The reverse pattern held for $\delta^{13}\text{C}$ variations, with peak $\delta^{13}\text{C}$ values coinciding with the narrow bands times of growth reduction. Ivany and Runnegar (2010) showed that oxygen isotope values varied seasonally over six years of growth within an early Permian bivalve. Zimmt et al. (2019) showed a strong correlation between $\delta^{18}\text{O}$ and seasonal variations in Pleistocene *Crassostrea virginica* oysters from the mid-Atlantic United States. In a study of Recent *Crassostrea* oysters from Altamaha Sound, Georgia, Andrus and Crowe (2000) showed that dark zones (representing times of faster growth during cooler months) consistently had higher $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ values. They concluded that banding patterns were generally seasonal, but dark bands could form at any time due to extreme heat or floods.

Band Counts Likely Underestimate True Age

Both creation and evolutionary scientists would agree that band counts likely underestimate true bivalve age for a number of reasons. First, biological ages are often assigned to *Crassostrea* oysters by counting periodic increments in the ligament area. In both fossil and modern oysters, the earliest part of the ligament area, representing the first two years of growth, is often missing (Kirby, 2001), but because this is true in both the fossil and modern specimens, this will probably not affect the comparison much.

Second, in very-long lived bivalves, bands become exponentially thinner over time, making them harder to see, which means the true age can be underestimated. Moss et al. (2017, p. 373) give an example in which the last 5 millimeters of growth in one species represented 20 out of 39 years of its lifespan.

In the following sections, we will be comparing data from Miocene, Plio-

cene, and Eocene *Crassostrea* oysters to data from Pleistocene and Modern *Crassostrea* oysters. If the Flood/post-Flood boundary is 'high' in the Cenozoic, then the Miocene, Pliocene, Eocene, and perhaps some of the Mid- or Lower Pleistocene (Holt, 1996) fossil oysters were killed during the Genesis Flood. This means they did *not* die natural deaths. In this case, sclerochronological band-counting can only approximate their ages at death, but this does not necessarily tell us anything about their true lifespan potential, at least not directly. Hence, these age estimates are likely underestimating true lifespan potential, perhaps significantly.

Even if one attributes upper Cenozoic fossilization to post-Flood catastrophic flooding, the catastrophic nature of that record is still consistent with this conclusion. Some fossil bivalves have their valves clamped shut, a strong indication that they were still alive when they were buried, consistent with catastrophic death and burial (Good, 2004; Hoesch and Austin, 2004). Hence, inferences from fossil *Crassostrea* data will likely underestimate true lifespan potential, regardless of whether those fossils are attributed to Flood or post-Flood catastrophism. Also, unless one wishes to assume that oysters were dying promptly upon reaching maturity, there is no good reason to assume that the ages at maturity necessarily represent the total potential lifespan. It seems more likely that the total potential lifespan would be greater.

Error Probably Insufficient to Affect Analysis

Clearly, there will be some error in bivalve band counts. Neither creationists nor evolutionists expect these counts to be perfect. But any such error will only invalidate the results if disturbance bands are both very numerous and very hard to identify. For the reasons given above, we do not think this will be the case.

Also, there does not seem to be any reason evolutionary paleontologists would want to favor greater oyster band counts over smaller ones, or *vice versa*. Thus, the problem of bias, due to preconceived expectations, that affects ice core and seafloor sediment age assignments (Oard, 2005; Hebert, 2021), is minimized.

Some paleontologists seem very confident that band counts can be reliable age indicators for bivalves in general and for *Crassostrea* oysters in particular (Kirby, 2001; Moss et al., 2021), regardless of location, provided that the analysis is done with appropriate caution. Zimmt et al. (2019) are more cautious, arguing that this has only been demonstrated to be true for Pleistocene *Crassostrea* oysters from the mid-Atlantic plain (USA). Nevertheless, there seems to be general agreement among sclerochronologists that, despite possible uncertainties, these banding counts are sufficiently accurate to conclude that mid-Atlantic Pleistocene *Crassostrea* oysters were indeed longer-lived than their modern-day counterparts living in the same area (Zimmt et al., 2019; see also the studies by Norton, 2021, and Falb, 2022).

Finally, evidence that *Crassostrea* oysters experienced much greater longevity than extant *Crassostrea* oysters does not depend entirely upon the band counts. We have already listed some reasons to suspect that larger adult body sizes are *also* indicators of great longevity, and we present examples below in which the fossil *Crassostrea* forms are *much* larger than the modern forms.

Fossil vs. Modern *Crassostrea*: Virginia, Maryland, and North Carolina (USA)

Kusnerik et al. (2018) performed a study using more than a thousand Pleistocene *Crassostrea* oyster fossils obtained from five assemblages in southern Maryland, Virginia, and North Carolina (Chesa-

Table I. Approximate maximum observed body masses and lifespans, as well as ages at first and full sexual maturity, for six Modern assemblages of the Japanese venerid bivalve *Phacosoma japonicum* (since reclassified as *Dosinia japonica*) compiled from data and figures in Sato (1994).

Locality	Max. Observed Mass (g)	1 st t_{sex} (years)	Full t_{sex} (years)	Max. Lifespan (years)
Ishikari Bay	63	>5	7	12
Hakodate Bay	53	4	5	11
Ariake Bay	45	4	5	9
Tokyo Bay	27	3	4	8
Seto Inland Sea	21	3	4	7
Kagoshima	16	2	3	7

peake Bay region, USA). This geographical area spanned $\sim 2.7^\circ$ in latitude. These specimens were supplemented by specimens from the Virginia Museum of Natural History. These were then compared with both modern specimens and specimens from the American colonial period. They excluded specimens with shell heights less than 35 mm, in order to avoid inclusion of immature oysters (spat) in the study, and they took care to ensure that all oysters came from environments with similar salinities (15–30 ppt).

Because the shell data were, in most cases, non-normally distributed, they used the Mann-Whitney U test to check for differences in shell height across Maryland, Virginia, and North Carolina. They found statistically significant size differences, shown in Table II. They also found statistically significant differences in growth rates between the modern, colonial, and Pleistocene specimens, with the colonial and modern oysters growing considerably faster than the Pleistocene specimens.

Of particular interest to this study, they found that Maryland Late Pleistocene (LP) oysters were significantly larger than both colonial and modern oysters (Figure 4). Virginia Middle Pleistocene (MP) oysters were also significantly larger than both colonial and

modern oysters (Figure 5). North Carolina MP oysters were significantly larger than LP oysters, but not modern ones (Figure 6). The difference between LP and Modern North Carolina specimens was also statistically significant.

The Pleistocene oysters were also longer-lived than the Modern and Colonial oysters. Age estimates were obtained by counting gray bands in the cross-sections of bisected hinges. In Maryland, Pleistocene oysters attained to ages of 12 years, whereas the modern and colonial oysters rarely lived beyond 5 years. In Virginia, Pleistocene oysters lived beyond 20 years, with colonial and modern oysters rarely living beyond 5 years. For the North Carolina specimens, Pleistocene oysters did not live beyond 4 years of age, and moderns did not attain to 3 years of age (there were no colonial North Carolina specimens).

Generally, Pleistocene *Crassostrea* oysters were larger, took longer to mature, and were longer-lived than more recent oysters. This supports our working hypothesis that, within a biblical kind (and not merely across kinds), larger body size does indeed seem to correlate with greater longevity. As warm Late Pleistocene (LP) oceans cooled at the end of the post-Flood Ice Age (Oard, 1990), one might naively expect *Crassostrea* longevity and body

size to have increased, due to cooling ocean temperatures. Yet the opposite occurred. This suggests that the factor causing greater longevity was strong enough to negate the competing counter-effect of warmer post-Flood and Ice Age oceans.

The results in Figure 6 partially contradict this expectation, however, as one would expect longer-lived Late Pleistocene (LP) oysters to be larger than shorter-lived Modern oysters. However, it should be noted that Pleistocene and Modern longevities in North Carolina were much more similar (no greater than 4 and 3 years, respectively) than they were in Virginia and Maryland. Hence, one might expect their body sizes to be more similar, as well.

In the next example we see additional evidence that Pleistocene *Crassostrea* oysters were longer-lived than recent specimens, and that fossils pre-dating the Pleistocene were both bigger and longer-lived than both Pleistocene and recent specimens.

Fossil vs. Modern *Crassostrea*: North Carolina and Virginia (USA)

Kirby (2001) counted internal growth ligaments to construct growth curves for Tertiary (Upper Miocene) and

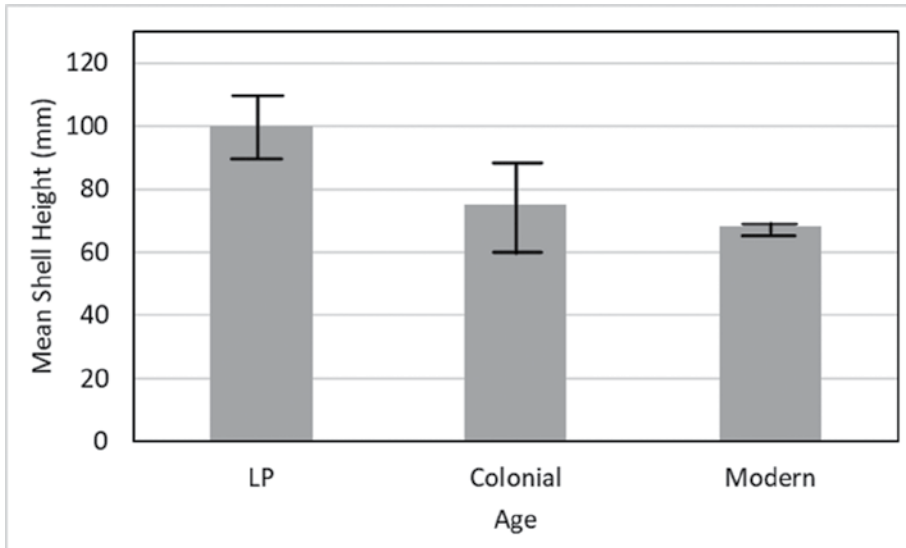


Figure 4. (left) Average shell heights for Late Pleistocene, colonial, and modern *Crassostrea virginica* specimens from Maryland. Error bars represent the standard error. Image credit: Richard Overman. After Figure 6a in Kusnerik et al. (2018).

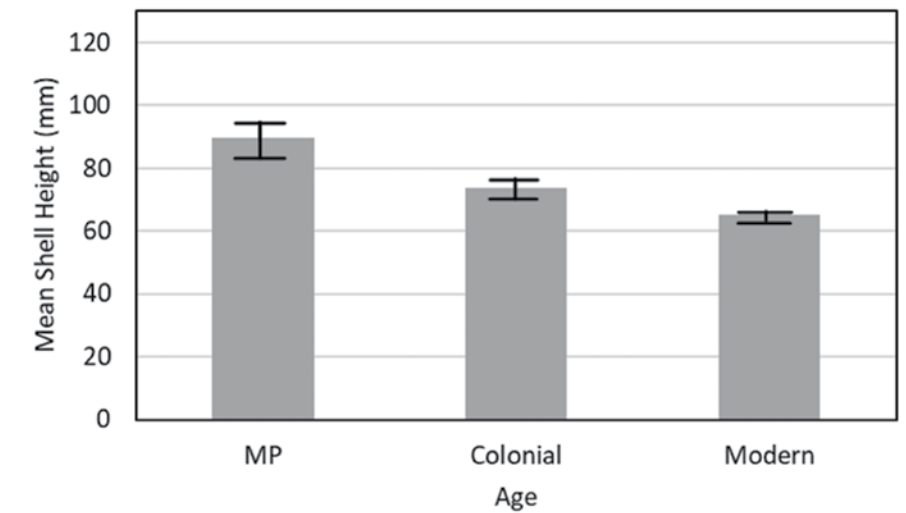


Figure 5 (left). Average shell heights for Middle Pleistocene, colonial, and modern *Crassostrea virginica* specimens from Virginia. Error bars represent the standard error. Image credit: Richard Overman. After Figure 7a in Kusnerik et al. (2018).

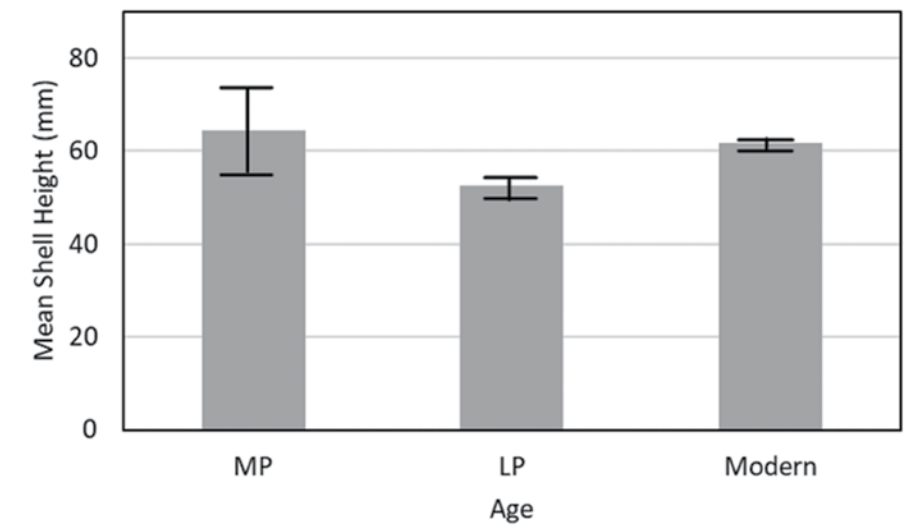


Figure 6 (left). Average shell heights for Middle Pleistocene, Late Pleistocene, and modern *Crassostrea virginica* specimens from North Carolina. Error bars represent the standard error. Image credit: Richard Overman. After Figure 8a in Kusnerik et al. (2018).

Quaternary (Pleistocene and ‘Recent’) *Crassostrea* specimens. The Miocene species, named *Crassostrea titan* because of its large size, was collected from two locations in California. The Pleistocene and ‘Recent’ specimens, *Crassostrea virginica* (Figure 1) were obtained from Virginia and North Carolina, respectively. All specimens were obtained from between 34.6 and 36.8° north latitude.

Although Kirby does not specify whether or not the Pleistocene strata are Early-, Mid-, or Late- Pleistocene, he does refer back to Spencer and Cambell (1987), who state that the Virginia clams are from Late Pleistocene marine sediments. The Late Miocene specimens were dated (Kirby, 2001) as between 8 and 12 million years old on the uniformitarian timescale.

In agreement with expectations, the Recent and late Pleistocene oysters were generally much smaller and (apparently) shorter-lived than the Miocene specimens (Figures 7, 8, and 9). It is also evident from Figure 8 that the slopes of the Miocene growth curves approach zero at much greater ages than do the Recent and Late Pleistocene specimens, indicating that the Miocene oysters took much longer to mature. Kirby performed a Mann-Whitney *U* test that showed a statistically significant difference ($p < 0.05$) in lifespan between the Miocene *C. titan* oysters and the more recent (Modern and Late Pleistocene) *C. virginica* oysters. The results generally agree with our expectations. However, the growth curve for the Recent specimens indicated a larger average adult body size than that possessed by the Late Pleistocene specimens, even though the Pleistocene specimens were longer-lived. This is contrary to expectations, if one assumes that larger body sizes are generally associated with greater longevity.

It should be noted that the average age of the Recent specimens was 3 years, the average age of the Miocene-1 specimens was ~7 years, and the average age

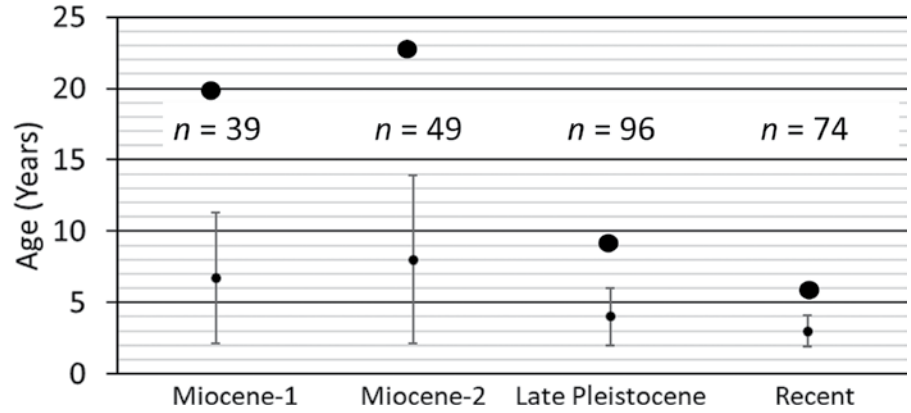


Figure 7. Maximum lifespans (large black dots) for four assemblages of California, North Carolina, and Virginia *Crassostrea* oysters, all collected between 34.6 and 36.8° north latitude. Maximum lifespans for the two Miocene (*Crassostrea titan*) fossil assemblages are much greater than those for the Late Pleistocene and ‘Recent’ (*Crassostrea virginica*) assemblages. Small black dots represent the average age of each assemblage, and error bar half-widths are standard deviations in assemblage ages. The number of fossil specimens in each assemblage is indicated.

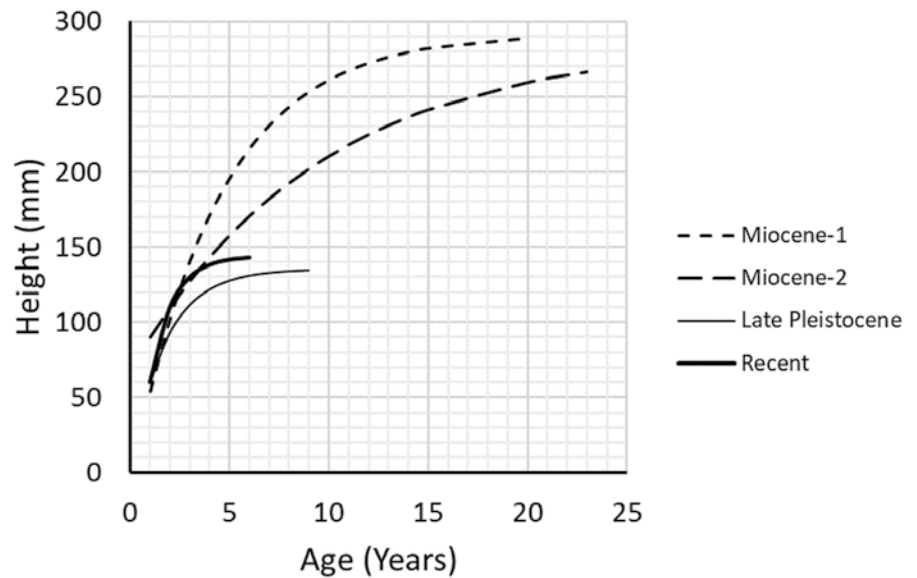


Figure 8. Height-versus-age growth curves constructed for the four *Crassostrea* oyster assemblages whose age data are summarized in Figure 7. After Figure 3B in Kirby (2001).

of the Miocene-2 assemblage was 8 years (Figure 8). Unless Kirby over-counted the true number of annual bands in the

Miocene assemblages by a factor of more than 2, it is difficult to avoid the conclusion that the Miocene *Crassostrea* speci-

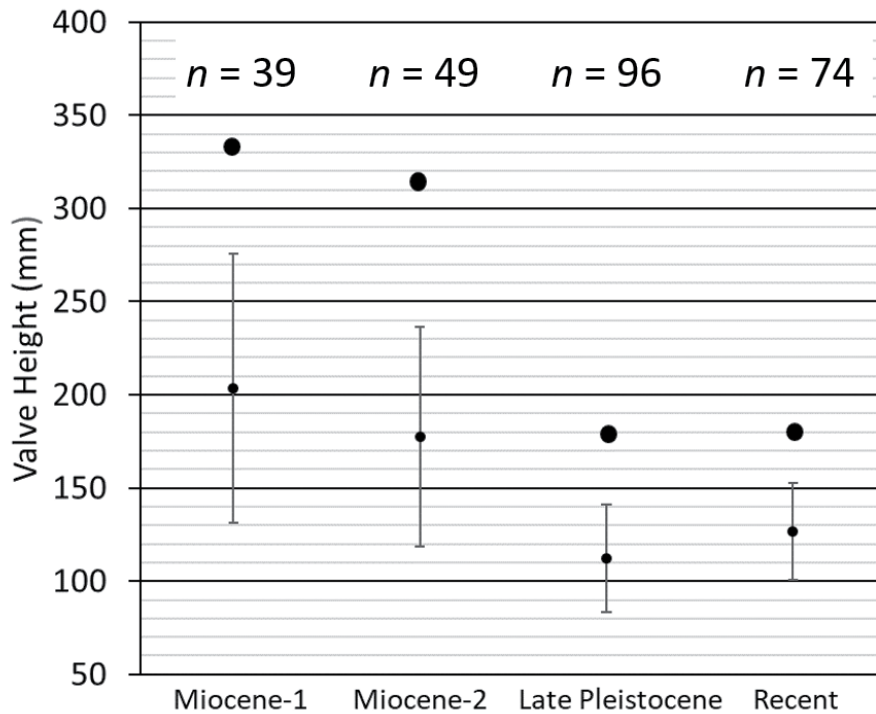


Figure 9. Valve height statistical data for the four *Crassostrea* oyster assemblages whose growth curves are shown in Figure 8. Dark black dots indicate maximum heights, small black dots indicate averages, and error bar half-widths represent height standard deviations. The number of specimens in each assemblage is indicated.

mens were indeed longer lived than the Recent specimens.

In today's world, at a given latitude, California Pacific coastal waters are considerably cooler than waters off the North American east coast (Herbert et al., 2016). For instance, according to the website of San Diego's Fleet Science Center (fleetscience.org, accessed October 31, 2023), the waters off the coast of San Diego are about 8.9° Celsius colder than waters off the coast of Charleston, South Carolina. This is because coastal California waters originates near Alaska, while waters off the eastern coast originate from the warmer Caribbean. Can uniformitarians attribute the extreme longevity of these California Miocene specimens to much colder Pacific water

temperatures? Probably not. Although uniformitarians believe a cooling trend began in the Miocene about 7 million years ago, they think the Miocene 12 to 8 million years ago was considerably warmer than today's world (Holbourn et al., 2018). A recent uniformitarian temperature reconstruction (Herbert et al. 2016, especially their Figure 2f) concluded that, on average, sea surface temperatures at the southern California margin were between 6 and 9° Celsius warmer than in today's world. Hence, by uniformitarian reckoning, California coastal sea surface temperatures at this time would have been comparable to Atlantic sea surface temperatures today. Moreover, Kirby did not even suggest colder waters as a possible explanation,

as he assumed that Late Miocene waters would be relatively warm. Nor can these great longevities be due to colder temperatures within a creationist framework, as most creationists think that the pre-Flood and immediate post-Flood worlds were characterized by relatively warm oceans.

Additional *Crassostrea* Observations

Some comments are in order before proceeding to the next example. Evolutionary scientists have acknowledged that the very large sizes of Tertiary *Crassostrea* oysters could be due to greater longevity (Kirby 2001, p. 84):

The reasons for producing such large shells have not been well understood, but previous studies have considered them to be a consequence of *longer life spans* due to the absence of human predation (Stenzel 1971), the presence of photosymbionts (Jones et al. 1988; but see Cowen 1983), or life on muddy substrates (Chinzei 1995). [emphasis ours]

Moreover, not only are the valve heights of the Miocene *Crassostrea* greater, but so are their valve (shell) thicknesses when compared to Recent and late Pleistocene specimens (Kirby's Figure 3A, not shown). Kirby suggests these large thicknesses were a defense mechanism against predation, but this is not the only possible explanation.

It should be noted that, in this and the following examples, some of these oysters were growing very rapidly in absolute terms, *faster* than many modern-day extant oysters. That is, the length or mass they gained per year was higher than that experienced by comparable extant organisms at the same ontogenetic stage. Kirby summarizes (2001, p. 89):

Estimation of life spans from ligamental increments and measurements of valve thicknesses and height shown that the *C. titan* specimens

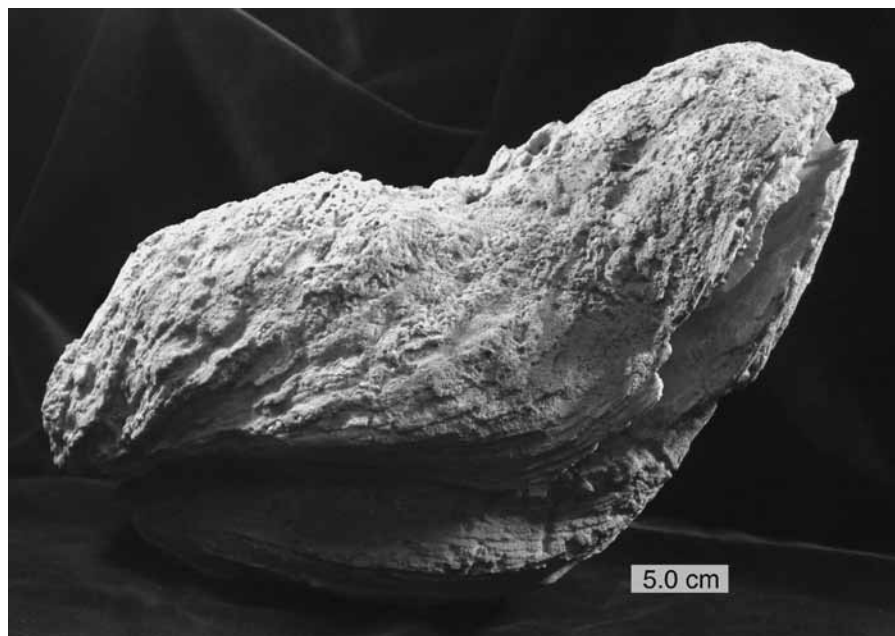


Figure 10. *Crassostrea gigantissima* fossil. Image Credit: Wilson44691. Creative Commons BY-SA 3.0 License.

lived two to three times longer and grew significantly faster than the *C. virginica* specimens.

Even though they were growing rapidly in absolute terms (millimeters or grams of growth per year), attainment of their larger adult body sizes required longer growth intervals than extant forms. Hence, the net effect was longer growth intervals, despite these higher absolute growth rates.

In a study of Pliocene *Crassostrea* oysters from the tropical Americas, Kirby and Jackson (2004) concluded that Miocene-Pliocene *C. cahobasensis* growth rates (in mass per year) were 2.5 times faster than those of Quaternary *C. virginica* and *C. columbiensis*. They concluded that the fast-growing *C. cahobasensis* went extinct, while the more slowly-growing *C. virginica* and *C. columbiensis* survived. But what if *C. virginica* and *C. columbiensis* are direct and more slowly-growing descendants of *C. cahobasensis*? We return to this particular example later below.

Eocene *Crassostrea* oysters from Texas (Finch, 1824) and Georgia (Edwards, 2016) can also be quite large and have been given the species names *Crassostrea gigantissima* (Figure 10). The extinct Miocene-Pliocene *C. ingens* from New Zealand was also classified as a giant *Crassostrea* oyster. According to Wikipedia, it had shell heights of 200 to more than 300 mm, comparable to the heights of the Miocene *Crassostrea* whose growth curves are shown in Figure 8. Unfortunately, it was not possible to confirm this size for *C. ingens* from a more scholarly source. It should also be noted that *C. ingens* was recently reclassified, although we have been unable to find its new taxonomic designation. Likewise, *C. gigas* was recently reclassified as *Magallana gigas* (World Register of Marine Species).

A study of 1,121 complete shells in a Miocene *C. gryphoides* bed in Austria (48° N latitude) showed that *C. gryphoides* apparently lived for at least 40 years (Harzhauser et al., 2016) and attained

heights of about 80 cm (Figure 11). Before it's reclassification as *M. gryphoides*, it was the largest known *Crassostrea* oyster, fossil or modern. Given that it's adult size is so much larger than the Miocene specimens shown in Figures 8 and 11, it probably does belong to a different genus than *Crassostrea*.

Interestingly, the vast majority of the clams in this Austrian assemblage lived less than ten years and grew to be 'only' about 30 cm in length, an intriguing observation in light of Robert Carter's (2023) recent suggestion that extremely long-lived individuals should be very rare in a given population.

Because of its recent change in classification, and because these Austrian *C. gryphoides* (or *M. gryphoides*) oysters were found at significantly higher latitudes than those in Kirby's study, it is probably inappropriate to directly compare the *C. gryphoides* growth curve to the other growth curves in Figure 11, even though they have all been depicted on the same graph.

However, *Crassostrea gigas*, the Pacific giant oyster, has been reclassified as *Magallana gigas*. The paleoenvironment for the Austrian *M. gryphoides* shell bed has been described (Harzhauser et al., 2016, p. 1225) as "comparable to the settings of modern *Crassostrea* reefs in the subtropical parts of the Asian Pacific." In that light, it is worth noting (Anonymous b, California Sea Grant, no date) that the Pacific giant oyster (*C. gigas* or *M. gigas*) has been known to grow to a size of 38 cm (15 inches). However, Cowles (2005) states *M. gigas* has a maximum size of 25 cm and "may live 20 years or more." According to Nehring (2011), unharvested *C.* (or *M.*) *gigas* oysters can live to be 30 years old. Yet Figure 11 shows that *M. gryphoides* took 40 years just to mature. So despite apparently living in a comparable subtropical environment, the Austrian fossil *M. gryphoides* was approximately twice as large and longer-lived than the extant giant Pacific oyster *M. gigas*!

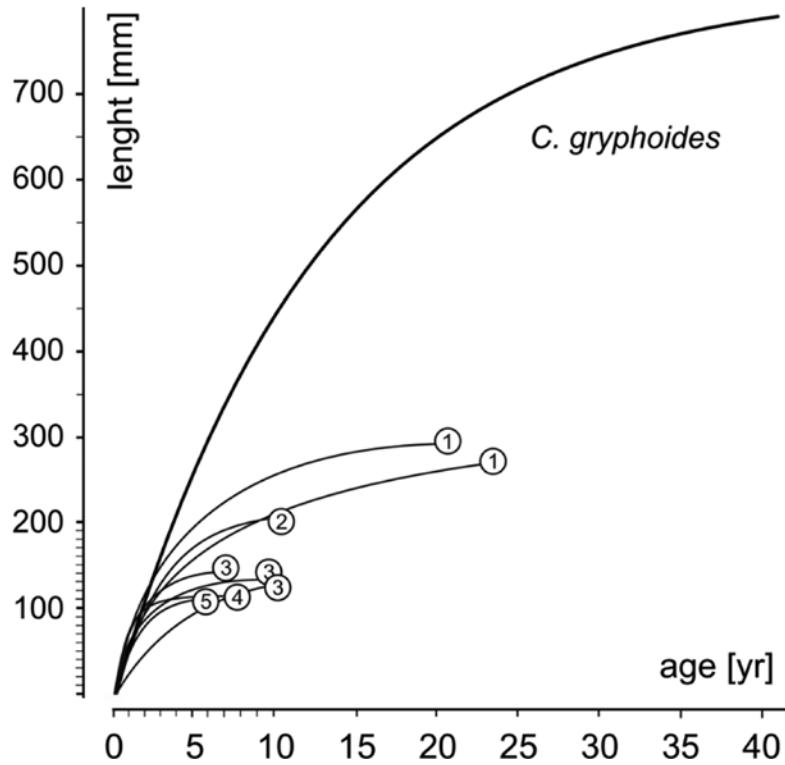


Figure 11. Figure 10 in Harzhauser et al. (2016), depicting the growth curve for *Crassostrea gryphoides* (now *Magallana gryphoides*) constructed from 1121 Early Miocene shells (Austria). Creative Commons Attribution 3.0 License. Growth curves labeled 1 are the same Miocene growth curves shown in Figure 8. Growth curve 2 is for *C. madrasensis* (recent, Bangladesh), growth curve 4 is for *C. corteziensis* (recent, Mexico), and growth curve 5 is for *Crassostrea gigas*, or *Magallana gigas* (recent, France). Two of the curves labeled “3” are the two *C. virginica* curves from Kirby (2001) shown in Figure 8, with the third such curve from a Chesapeake and Delaware Bay study of recent *C. virginica* by Powell et al. (2011). Despite the broad geographical distribution of the Recent oysters, their growth curves are *all* consistent with accelerated maturation and smaller body sizes compared to the Miocene specimens (curves 1).

It should also be noted that *all* the modern *Crassostrea* growth curves from France, Bangladesh, Mexico, and the Atlantic coast of the United States (curves 2–5 in Figure 11) indicate smaller body sizes and accelerated maturation compared to the two Miocene *Crassostrea* curves from California (curves 1), despite their wide latitude distribution and the taxonomic uncertainty of the *C. gigas* or *M. gigas* specimen from France (curve 5).

Some evolutionists have acknowledged a close link between fossil and extant *Crassostrea* clams, despite their assignment to different species. Sohl and Kauffman (1964, p. H1) argued that *C. virginica* may be the modern representation of both the Cretaceous *C. cusseta* (now a defunct classification) and the Eocene *C. gigantissima*:

C. cusseta is the terminal Cretaceous member of the *C. soleniscus* lineage in [American] gulf coast sediments;

the lineage continues, however, with little basic modification, through the Cenozoic, being represented in the Eocene by *G. gigantissima* (French) and probably, in modern times, by *C. virginica* (Gmelin).

Lawrence (1991, p. 342) goes even further, saying, *C. gigantissima* “is most certainly the direct ancestor of *C. virginica*.” If *C. gigantissima* is the “direct ancestor” of today’s *C. virginica*, isn’t this just another way of saying that *C. virginica* and *C. gigantissima* are really the same Genesis ‘kind’ or baramin? The much greater sizes and growth intervals of *C. gigantissima* compared to *C. virginica* are indirect evidence that *C. gigantissima* was experiencing much greater longevity than its modern-day descendants. According to the World Registry of Marine Species (marinespecies.org), *C. virginica* commonly has a length of about 8.5 cm, whereas *C. gigantissima* was much, *much* larger. Some *C. gigantissima* specimens (Figure 10) were more than 55 cm in length (Edwards, 2016, p. 5).

In passing, we should note that if we accept the respective taxonomic reclassifications of *C. gigas* and *C. gryphoides* to *M. gigas* and *M. gryphoides*, we now have evidence of extreme past longevity from two different oyster genera, rather than just one.

***Crassostrea* Oysters from the Tropical Americas**

Kirby and Jackson (2004) compared body sizes and growth rates of 542 Miocene, Pliocene, and Quaternary juvenile (ages less than 7 years) *Crassostrea* oysters from the tropical Americas. Their study included Recent, Holocene, and Pleistocene *C. virginica* from Venezuela, Trinidad, Panama, Barbados, and Costa Rica; Recent and Pleistocene *C. columbiensis* oysters from Panama; Pliocene and Miocene *C. cahobasensis* from Venezuela and Panama, and Pliocene *Crassostrea* aff. *C. virginica* specimens,

Table II. Results of Mann-Whitney U tests for differences in shell heights between Late Pleistocene (LP), Middle Pleistocene (MP), colonial, and modern *Crassostrea* specimens. Statistically significant differences are highlighted in bold. After Table 2 from Kusnerik et al. (2018).

	Maryland	Virginia	North Carolina
MP vs. LP	–	–	$Z_{225,21} = -2.93$ $p = 0.003$
MP vs. Colonial	–	$Z_{647,364} = -4.48$ $p < 0.0001$	–
MP vs. Modern	–	$Z_{647,6916} = -15.15$ $p < 0.0001$	$Z_{21,5443} = -1.05$ $p < 0.29$
LP vs. Colonial	$Z_{36,3} = -1.69$ $p = 0.09$	–	–
LP vs. Modern	$Z_{36,1176} = -6.44$ $p < 0.0001$	–	$Z_{225,5443} = -3.76$ $p < 0.0001$
Colonial vs. Modern	$Z_{3,1176} = -0.69$ $p = 0.49$	$Z_{364,6916} = -9.56$ $p < 0.0001$	

whose taxonomic status was uncertain, from Trinidad, Jamaica, and Venezuela (Table III). With the exception of the Jamaica specimens (18° N latitude), all oyster specimens were collected from a latitude band of ~4.6° (Figure 1 in Kirby and Jackson, 2004).

Kirby and Jackson (2004) calculated estimated carbonate content of these shells. They also used an allometric relationship to estimate total biomass for the specimens. The Miocene and Pliocene *C. cahobasensis* specimens were consistently larger, at all ages, than the Quaternary *C. virginica* and *C. columbiensis* oysters (Figure 12). This was true regardless of whether estimated carbonate content or biomass was used as a measurement of body size. With the exception of some Recent *C. columbiensis* oysters from Panama, most of the Recent oysters seem to have been *C. virginica*. It is thus striking that the Recent *C. virginica* oysters are consistently smaller than the Pleistocene

Table III. Uniformitarian age assignments and locations from which *Crassostrea* specimens were collected from the tropical Americas. The *C. aff. C. virginica* specimens are of uncertain taxonomic classification but have an affinity (aff.) or resemblance to *C. virginica*.

Conventional Age Assignment	Species	Location(s)
Recent	<i>C. virginica</i>	Venezuela and Trinidad
Recent	<i>C. columbiensis</i>	Panama
Holocene	<i>C. virginica</i>	Panama
Late Pleistocene	<i>C. virginica</i>	Panama
Pleistocene	<i>C. virginica</i>	Costa Rica, Venezuela, Barbados, Panama
Pleistocene	<i>C. columbiensis</i>	Panama
Early Pleistocene	<i>C. virginica</i>	Trinidad
Pliocene	<i>C. aff. C. virginica</i>	Trinidad, Venezuela, and Jamaica
Pliocene	<i>C. cahobasensis</i>	Venezuela
Early Pliocene	<i>C. cahobasensis</i>	Venezuela
Late Miocene	<i>C. cahobasensis</i>	Panama and Venezuela
Miocene	<i>C. cahobasensis</i>	Panama

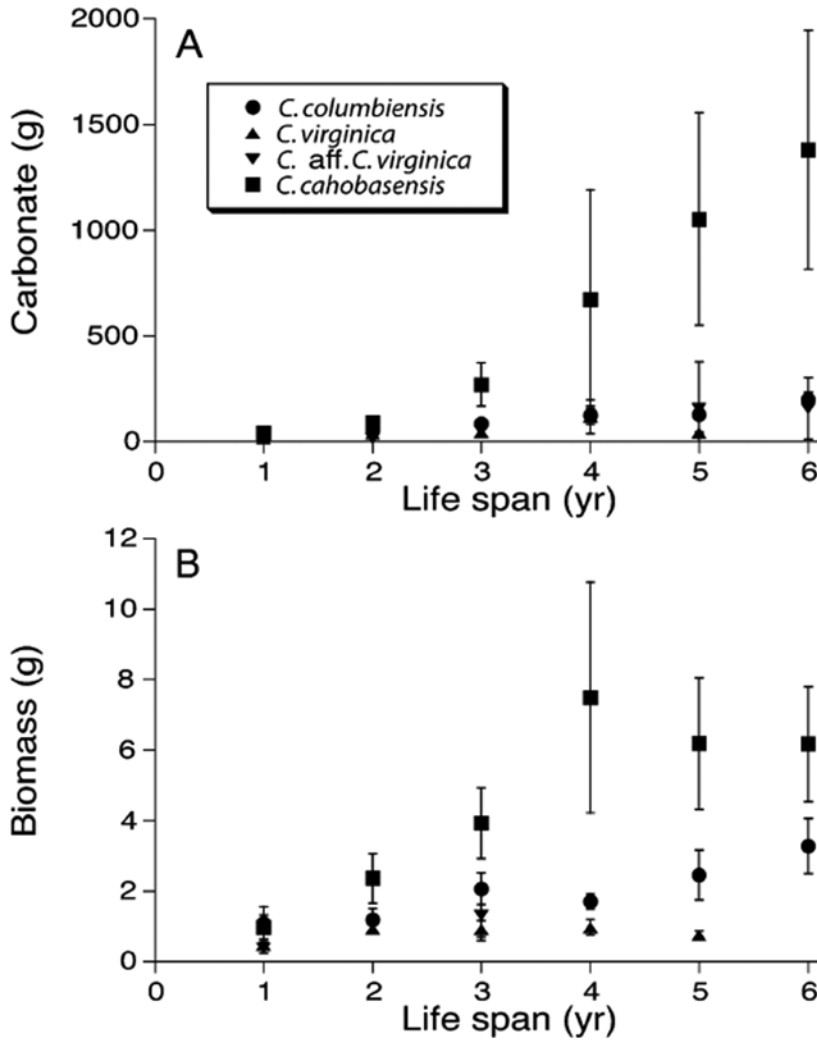


Figure 12. Figure 3 from Kirby and Jackson (2004), showing that juvenile Pliocene and Miocene *C. cahobasensis* specimens have larger body sizes at all stages of ontogenetic development compared to juvenile Recent and Pleistocene *C. columbiensis* and *C. virginica* specimens, regardless of whether estimated carbonate shell content (a) or total estimated biomass (b) is used as a measurement of size. Error bars represent 95% confidence intervals. Fair Use Application, used by general permission of the Geological Society of America.

C. columbiensis oysters, which are consistently smaller than the Miocene and Pliocene *C. cahobasensis* oysters. With the one exception of the Pliocene *C. aff. C. virginica* oysters, whose taxonomic status is uncertain, the pattern is consistent with our working hypotheses that adult body sizes are associated with longer-lived organisms, and that both

human and animal longevities were decreasing after the Flood.

Note also that a Pacific-Atlantic temperature gradient is insufficient to explain these size differences, as inspection of the data in Table I and Figure 1 in Kirby and Jackson (2004) show that nearly all the *Crassostrea* specimens were collected from locations on the

Atlantic side of Central and South America.

Concluding Remarks

Hebert (2023) accumulated preliminary evidence of extreme longevity in fossil forms (bivalves, alligators and crocodiles, sharks, and possibly birds). Since humans once experienced much greater longevity, and since whatever conditions enabled this longevity likely also affected the animal kingdom, this result makes good sense in light of the Bible’s testimony. It also has the potential to be a great encouragement to Bible-believing Christians, especially if it can be shown that this longevity was experienced by a wide array of organisms. Although these preliminary results are potentially encouraging, they require more in-depth analysis, and potential objections to these arguments need to be addressed. This paper was an attempt to do that in the case of *Crassostrea* oysters, specifically. This paper also helps illustrate some of the steps suggested by Overman (2021) in performing creationist scientific research. Specifically, the Bible’s statements regarding past human longevity were taken seriously and used to derive conclusions that could be (and were) tested.

Because bivalve fossils are extremely abundant (Morris and Sherwin, 2011), creation researchers could potentially do original field work in this area. However, the already-published research in the mainstream paleontological literature should not be neglected, as it is likely that much evidence of such longevity has already been published but has simply been overlooked by evolutionary researchers.

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How the World's Most Educated People Produced the Worst Holocaust in History

Jerry R. Bergman

Abstract

Nazism was fueled by highly educated and intelligent minds, establishing a confusing contradiction, since intelligent people should be able to recognize inhumane actions. This situation further revealed that Germany, as well as much of the Western world, was not exempt from the power that a non-Biblical worldview can have over even academically advanced individuals. A most significant reason that Nazi ideology was embraced by intelligent people is because the German educational system had inculcated Darwinian and Social Darwinian ideas for years prior to the Holocaust. Nazi leaders and German educators embraced them and taught them. All levels (including preschool) of German academia incorporated the study of eugenics, an indoctrination which played a crucial role in propelling the Germans toward racist ideology which ultimately led to the justification of Holocaust horrors. While educational censorship was a reality that kept truth from being expressed, the foremost reason that Nazi ideology spread and birthed such horrendous consequences was because German leaders and “the intelligentsia” who were fueling the educational systems rejected the Bible. Nazism would not recognize the Genesis account of creation and therefore acknowledge the fact that all mankind was created in the image of God and came from one couple—Adam and Eve. As is the way of orthodox Communism, no alternative explanations were permitted—“intelligence” meant comply or be shot, persecuted, or rejected.

Key Words: Adam and Eve, Darwin, evolution, Genesis, Nazism, World War II

Introduction

The Holocaust was designed and carried out by well-educated professional people in the most educated nation on

Earth. How and why this happened is the subject of this review. As historian Stephen Hicks asserts, the “list of intellectuals who supported the Nazis long

before they came to power...represents a ‘Who’s Who’ list of powerful minds and cultural leaders” (Hicks, 2010, p. 9). Before the war, Germany boasted more Nobel laureates in science than any other nation, including the United States. Furthermore, eugenic goals based on the myth of superior-inferior human races

were central to the Holocaust and, in the end, ultimately lead to the atrocities of WWII. An important step toward the Nazi Holocaust was

Charles Darwin's *Origin of Species* [which] profoundly undermined the Biblical basis of understanding human groups by declaring that human beings had evolved...over hundreds of millennia, and by suggesting that races had evolved by a process of adaptation.... Darwin offered the prospect of understanding the human race biologically, and it was a short step for certain of his followers to invoke natural selection and survival of the fittest as the basis of human behavior and racial characteristics. In the United States there were early Darwinists who appealed to the theory in support of white superiority.... In Germany, however, Darwinism took a rather different direction: calls for social intervention that would control selection in order to avoid the degeneration of human groups.... beyond this lay the promotion of the superiority of the Germanic peoples...and the need to combat Christianity. (Cornwell, 2003, p. 76)

A leading historian of Nazi Germany, Edwin Black, documented that the Nazi government's eugenics goals dictated how people would live and die. In short, "Hitler's regime was one of totalitarian aspirations. The Nazi system was built on ideology and terror...and institutional Darwinism" (Childers, 2001, p. 22). It was the Nazi physicians who "would become the unseen generals in Hitler's war against the Jews and other Europeans deemed inferior. Darwinian-influenced doctors created the science, devised the eugenic formulas, wrote the legislation, and even hand-selected the victims for sterilization, euthanasia, and mass extermination. Black shirts and Brown shirts would inflict the horror—but

white coats directed it" (Black, 2009, p. 35). American psychiatrist and Harvard associate, Robert Lifton, records the horrors of Nazi medical techniques, concluding that it was the doctors in Auschwitz that ordered, supersized, and sometimes carried out the murder of over a million persons in that camp (Lifton, 1986, p. 18). Lifton called Auschwitz "the racial cure" of the problems of Germany (1986, p. 145). Researchers Annas and Grodin further commented that Nazi physicians also "became leaders in the National Socialist Party and were honored for their work.... The Nazi theory, based on a social Darwinist view of genetics and racial purity, meshed perfectly with the Nazi ideology (Annas and Grodin, 1992, p. 15).

Actually, the Nazi nurses (many of whom were women) directly killed many more persons than did the Nazi physicians (McFarland-Icke, 1999; Benedict and Shields, 2014). As Darwin opined in his *Descent of Man*, women were inferior to men. German women were forced to follow the commands of the 'superior' men and believed they had to carry out the killings they were directed to execute. By refusing to do so they could face sterilization, persecution, torture, or internment. The German system (once again, based on evolution) had indoctrinated enough of their women to willingly carry on the work associated with 'racial purity'/'racial cleansing.'

The physicians' social Darwinist core belief was that certain individuals, or groups of people, were genetically superior to others. The Nazis wholeheartedly embraced this idea, and for this reason social Darwinism was central in bringing about the Holocaust. Furthermore, they made "widespread use of the Darwinian term 'selection,' [and] the Nazis sought to take over the functions of nature (natural selection) and God...in orchestrating their own 'selections,' their own version of human evolution...the resulting 'racial and so-

cial' biology could make vicious forms of anti-Semitism seem intellectually respectable to learned men and women" (Lifton, 1986, p. 17).

The result was a "biocracy" where the state was the means to apply biological Darwinism to the entire territory that was controlled by Germany. There were so many doctors that were influential in the Holocaust and Nazism that a separate trial was held for them at Nuremberg. Twenty of the 23 persons tried for war crimes at this trial were medical doctors (Vollmann and Winau, 1996, p. 1445). Excluding seven of the 23 tried at Nuremberg (acquitted only because the court did not find 'enough' evidence to convict them), all others were sentenced to life imprisonment, or death by hanging. Most were committed Nazis, completely committed to the Nazi eugenics program (Annas and Grodin, 1992, p. 106).

Psychological Evaluations of Leading Nazis

Many top Nazis, such as Adolf Hitler, Joseph Goebbels, and Heinrich Himmler committed suicide before, or very soon after, Germany surrendered. The leading Nazis still alive were subjected to the Nuremberg war-criminal trials. Prior to the Nuremberg trials, psychiatrists were brought in to determine the dominant beliefs of the Nazi leaders, so as to better understand what fueled their destructive ideology.

The psychological testing and evaluations were driven by the scientific community's desire to determine the motivation for the Nazi war crimes because their crimes called into question the very nature of humankind. Thus, an urgency existed to conduct detailed psychological examinations on living Nazi leaders as soon as feasible.

The leading psychiatrist charged with examining the head Nazis was an American, Columbia University-trained, Lt. Colonel Dr. Douglas Kelley. The

principal psychologist was American Lt. Dr. Gustave Gilbert, also Columbia University-trained. These doctors evaluated 21 of the high-level Nazi leaders on trial for war crimes.

From these interviews, it was determined that the reasoning the Nazi leaders used to justify the Holocaust was that they believed that the people who succeeded in society thrived due to their superior genes. The people who lived in less-developed cultures were less capable due to their inferior genes (Dimsdale, 2016, pp. 13–14). They also believed that even a taint of an inferior race carried a genetic proclivity to disease and cultural inferiority. They believed that, similar to how humans cull inferior animals to improve the breed, so too must we remove inferior humans from society to achieve the same goal.

The leading Nazis also believed that race was in the blood. Having bad blood was similar to typhoid carriers that passed the bad blood to their offspring. Since no one can change their genetics by education, or any other improved environment, the inferiority in the blood was believed beyond reform or redemption. The only solution was that the inferior genes must be bred out of society. This ideology was summarized by the Nazi slogan “Blut und Boden” (“blood and soil”) which was Nazi Germany’s ideal of a racially defined national body (“blood”) united with a settlement area (“soil”). Harvard University government and social studies professor, Daniel Goldhagen, has extensively documented that the primary goal of Hitler and the Nazi Movement was to annihilate the “bad blood,” especially the Jews (Goldhagen, 1996, p. 86). The fact is, “Hitler was not primarily interested in conquest; conquest was but a means to an end. The ultimate objective was the realization of Nazi ideology based on racial superiority in which the Jews—and other groups, including the Roma—would be killed” (Holmes, 2022, p. 34).

WWI’s Precursor to the Holocaust

The deaths that resulted from WWI, plus national humiliation and severe inflation that resulted from Germany’s loss of the war, enraged many Germans. This rage, coupled with Darwinian indoctrination that their suffering was due to the acts of “sub-humans,” resulted in a desire for vengeance against the Jewish, Roma, and other minorities who many believed contributed to Germany’s defeat. A major problem after WWI was that not enough food existed to share with these so-called “useless eaters and vermin.” This influenced Hitler’s vision ...to obliterate all of the undesirables and to provide the purified Aryan nation with the freed-up space and confiscated resources so that a resurgent Germany could rule the world in security and plenty. With a strong leader, he believed that Germany would march from humiliation to triumph and complete its manifest destiny by expanding into a fruitful land that had been cleared of all non-desirables. It was an intoxication that swept the nation. (Dimsdale, 2016, p. 14)

This ideology produced a fertile philosophical ground that led to the acceptance of social Darwinism, which dominated the leadership of the Nazi Party intelligentsia. The German intelligentsia consisted of scholars, academics, teachers, journalists, and literary writers. In the early 1900s, eugenics was widely accepted, not only by the German intelligentsia, but also by the intelligentsia of the West as a whole. For these and other reasons it was the well-educated that supported Nazism and Nazi goals, even though their racist ideas were not only morally wrong, but led to the largest mass murder in recorded history. Nazi historian, Professor Stephen Hicks, observed that even before the Nazis came to power,

German intellectuals were among the world leaders in eugenics re-

search. In 1916 Dr. Ernst Rudin, the director of the Genealogical-Demographic Department of the German Institute for Psychiatric Research, established a field of psychiatric hereditary biology based on eugenics theory. Rudin became the president of the International Federation of Eugenic Organizations, the world’s leader of the eugenics movement...By the time the Nazis came to power, eugenics was an established part of German intellectual life. One striking indication of this is that German Universities had twenty-three official professors of Racial Hygiene. National Socialism held that the state should take over where natural selection left off. (Hicks, 2010, pp. 36–37)

One of the main causes of the Holocaust was the “racial hygiene” worldview, and evolution in general, which the German people widely believed at this time (Dimsdale, 2016, pp. 12–13).

Hitler Becomes a Darwinist

While still living in Vienna, around 1907, Hitler embraced “a crude hackneyed Darwinism” (Low, 1996, p. 3). This Darwinism would form the foundation of his thought, especially his views on Lebensraum. The concept of Lebensraum (“living space”) referred to “settler colonialism” which was deemed as the undeniable right of the superior race (Low, 1996, p. 3). This Lebensraum belief was central to Germany’s invasion of Russia. Hitler was also among those who read the works of the leading Darwinist in Germany, Professor Ernst Haeckel. Hitler then selected the social Darwinist ideas which he found in Haeckel and other German Darwinists (Remak, 1990, p. 3). Haeckel was “a towering figure in German biology, an early Darwinian, and was also a racist” (Lifton, 1986, p. 125).

Gottfried Feder was the founder of the original German Workers’ Party

which later changed its name to the National Socialist German Workers' Party, abbreviated as the Nazi party. The name change was to express its core value more accurately, namely socialism. When Hitler first heard the anti-capitalist views of Feder he said they changed his life (Dornberg, 1982, p. 344). Feder greatly influenced Hitler's more aggressive opposition to Jews. The party platform was written by Feder, Hitler, and a politician named Anton Drexler. Drexler had written a 40-page anti-Semitic, anti-socialist, anti-capitalist pamphlet titled *My Political Awakening*, which also greatly influenced Hitler (Kershaw, 2010, p. 75).

Hitler's opposition to Jews was based on beliefs that he accepted from Feder, Drexler, and others. These included the idea that many of society's problems were due to "the world domination of the Jews," and that Jews were the major threat to German society (Cawthorne, 2022, p.18). The exact contributions of these two men is unknown, but we know they had a major influence on Hitler. Hitler had few original ideas, choosing rather to assimilate the ideas of other intellectuals and run with them (Kershaw, 2000).

The Influence of Rudolf Hess and Karl Ernst Haushofer on Hitler

University of Munich professor Karl Ernst Haushofer (1869–1946) was one of the most important originators of the ideas that culminated in WWII (Low, 1996, pp. 25–32). In 1919, Haushofer met a university student named Rudolf Hess, one of the original founders of the Nazi Party. Both Haushofer and Hess naively accepted Darwin's worldview and successfully implemented it into the German Nazi policy.

In 1923, Adolf Hitler and Rudolf Hess were part of the failed attempt to overthrow the German government. When Hitler and Hess were imprisoned

for their part in the coup they were visited by Haushofer. During the summer and fall of 1924, Haushofer spent many Wednesdays holding seminar-style lectures with the two inmates. As a result, Hitler later claimed that "Landsberg was my university [education] at state expense" (Herwig, 2016, p. xiv). Furthermore, Hitler read "the second edition of the first great German eugenic text, *Foundation of Human Heredity and Racial Hygiene*, which had been published in 1921," written by three leading academics, Erwin Baur, Eugen Fischer, and Fritz Lenz (Black, 2003, p. 270). This textbook was very well-received in academic circles and became the standard text on racial hygiene in Germany, before and after the Nazi Party ruled Germany.

From these and other eugenicists, Hitler codified the central place of eugenics in his book *Mein Kampf*, which became the bible of both the Nazi Movement and Nazi Germany. In that book he stressed his goal of removing by whatever means possible, or enslaving, the inferior races, including Jews, Slavic people, and Romani. In the end, Hitler's main priority was genocide, not conquest (Holmes, 2022). He also made clear that he had no qualms about using brutality to achieve Nazi goals, stating that a

pogrom is a splendid thing, but nowadays it has lost a good deal of its Medieval effectiveness.... How would it profit us to eradicate the Jewish population of Munich when the Jews in the remainder of the country, as it is now, still control money and politics? In all of Germany there are more than a million Jews. What do you want to do? Kill all of them during the night? That would, of course, be the best solution, and if that were done then Germany would be saved. But that isn't possible....the world would attack us instead of thanking us as they really should do. The world has not

understood the Jewish question for the simple reason that they are ruled by the Jews....The Jewish question is a chain, and Germany must tear this chain if it does not want to die. (Bryant, 2022, pp. 131–132)

Nazi Leaders Had High IQs

The world was shocked by the fact that a highly educated, culture-rich nation such as Germany could be the source of the worst sadistic war crimes, including genocide, in history.

The evaluations of the psychologists described above included evaluating Nazi leader's intellectual capacity, which demonstrated that they all possessed significantly above-average IQ's. The average IQ of the 21 Nazi leaders was 128, nearly two standard deviations above the average IQ of 100 (Dimsdale, 2016). The conclusion was that these men possessed a higher IQ than 97 percent of the general population.

Hitler's second in command, Hermann Göring, scored 138 on his IQ test, or above 99.4 percent of the population. Hitler's chief administrator over German-occupied Netherlands, Seyss-Inquart, scored 141, which was above 99.7 percent of the population. Seyss-Inquart spearheaded the deportation and murder of tens of thousands of Jews. The inescapable facts of his involvement in genocide led to his conviction of crimes against humanity and his execution in 1946.

Joseph Goebbels

One man whose ideas were critically important in Hitler's Nazi program was Nazi propagandist, Dr. Joseph Goebbels. His IQ will remain a mystery because he committed suicide along with his wife, after murdering their six children in the last days before the war ended. Goebbels was

the most brilliant and educated of all the Nazi politicians....he was one of the most powerful of the very

top Nazis—perhaps number two or three after Hitler....He received a wide-ranging classical education by attending five universities in Germany, eventually receiving a Ph.D. in literature and philosophy from Heidelberg University in 1921. During his graduate days he absorbed and agreed with much of the writings of communists Karl Marx and Friedrich Engels, especially their searing condemnation of capitalism. (Hicks, 2010, p. 18)

As true Darwinists, the Nazis recognized that “The major battle is between different racial and cultural groups with different biological histories...between Germans—with their particular biological inheritance and cultural history—[and] all other racial cultures” (Hicks, 2010, p. 19). To enforce their position in the race battle, Point 23 of the Nazi Party platform calls for strict censorship of all newspapers and Point 24 puts limits on religions that do not agree with Nazi goals. Later, these same rules became central to the suppression of creationists in the American academia as documented by Bergman (2008, 2012, 2016, 2019).

Nazi Race Studies Programs

Race studies programs in German schools taught which races were superior and which were inferior, how to identify them, and why this information was of central importance to the overall health of German society. Consequently, the better-educated Germans were more likely to be indoctrinated into accepting Nazi racial ideology, and thus supported the implementation of this ideology. Minister of the Bavarian Ministry for Education, Dr. Hans Schemm, wrote, “National Socialism is politically applied biology,” an idea that he incorporated into the curriculum programs which he developed or supported (Bäumer-Schleinkofer, 1995). Biology, especially evolutionary biology, had enormous

prestige in the Third Reich because it was used to give the Nazi eugenic worldview a scientific veneer. It did this by providing what they believed was incontrovertible proof of the validity and importance of Nazi racist goals and plans (Bäumer-Schleinkofer, 1995). Race studies that were developed by the medical profession became the central topic in biology teaching (Bäumer-Schleinkofer, 1995). Furthermore, certain “racially” oriented disciplines, including genealogy, population genetics, race hygiene, anthropology, and “Darwinian evolution were critical resources for National Socialism because they appeared to provide scientific validation for the eugenicist and racist doctrines enshrined by the party” (Harrington, 1996, p. 175).

Foremost Scientists that Supported Eugenics

Listed below are some leading German intellectuals who not only accepted, but actively supported, Hitler and the Nazi race ideals. Arthur Moeller van den Bruck was a cultural historian, philosopher, and writer best known for his 1923 book, *Das Dritte Reich (The Third Reich)*, which promoted German nationalism. University of Greifswald professor Dr. Carl Schmitt was one of the most-respected legal minds in Europe and the author of many important books. He was a German jurist and political theorist who provided much intellectual support for, and was actively involved in, the Nazi movement. Soon after he joined the Nazi Party, Greifswald supported the burning of books by Jewish authors and “un-German” and “anti-German” material, calling for a much more extensive purge to include authors influenced by Jewish ideas.

The 1912 Nobel laureate in literature, dramatist and novelist Gerhart Hauptmann, was also a committed Nazi. He described his meeting with Hitler as the “greatest moment of my life” (Hicks, 2010, p. 9). He was a founding member

of the eugenics organization, “The German Society for Racial Hygiene.” German historian and philosopher of history, Dr. Oswald Spengler, was the author of the bestselling two-volume set titled *The Decline of the West*, which was widely read and endorsed by many acknowledged German and international intellectuals.

University of Freiburg professor Martin Heidegger, “widely considered one of the most influential thinkers of the twentieth century,” joined the National Socialist German Workers Party in 1933 (Palmer, 2016). Heidegger organized and supervised several militaristic organizations of university students and faculty working for Nazism.

Heidelberg University professor of theoretical physics Philipp Lenard was awarded the 1905 Nobel Prize for his important discoveries involving cathode rays. Lenard was an anti-Semite and an active proponent of the Nazi ideology. He actively supported Adolf Hitler in the 1920s and was Hitler’s “Chief of German Physics” during the Nazi era. His loyalty to the Nazi beliefs motivated him to dismiss Albert Einstein’s science contributions as inferior “Jewish physics” (Wheaton, 1978, p. 299).

Johannes Stark, a University of Munich professor, was awarded the Nobel Prize in physics in 1919 for his discovery of the Doppler effect and the splitting of spectral lines in electric fields (*The New York Times*, 1957, p. 15). He joined the Nazi Party in 1930 and was a committed Nazi until World War II ended. After the war, his Nazi support was considered so significant that he was sentenced to four years in a labor camp by the German de-Nazification court.

Why Were So Many Highly Intelligent Persons Leading Nazis?

These and many other intellectuals believed that Nazism was based on uncontroverial scientific evidence. They

also believed that Nazism was noble and the ultimate hope of humanity. Furthermore, in harmony with Darwinism, they believed that peace makes people soft and, in contrast, war makes people vigorous and strong. Strong people, in contrast to weak people, are also willing to fight, and even die for, their ideals.

Many leading German scientists were supportive of eugenics which, in the 1920's and 30's, was widely considered "settled science" in biology. Eugenics is defined in the reference books as "The study of methods of improving the quality of human populations by the application of genetic principles" (Hine, 2015, p. 209). Consequently, Nazism, and thus Hitler, enjoyed a great deal of support from not only the scientific establishment but from those who supported academia and science in general. Rudolf Hess, Hitler's Deputy Fuhrer, declared in 1934 that "National Socialism is nothing but applied biology" (Michalczuk, 2022, p. 32).

The Nazis also had the support of the worldwide eugenics movement, which consisted of numerous professors. The Nazi eugenics program was based on research by American eugenicists, especially Harry Laughlin. Laughlin was awarded an honorary doctorate in 1936 from the University of Heidelberg for his work in the "science of racial cleansing" (McDonald, 2013). Furthermore, once the Nazi Party came to power, the worldwide scientific prestige of Germany facilitated the ruthless and inhumane spread and application of eugenics and racist ideas. Hitler brazenly made his racist anti-Semitism his first goal (Goldhagen, 1996, p. 86).

Many leading German educators also accepted the belief that science supported Nazi race theories. In 1933, "race studies" teaching was required throughout the entire German Reich. Consequently, racism was taught in German schools from 1935 until the war ended in 1945. (Bäumer-Schleinkofer, 1995, p. xiii). During this time, German

school final examinations included racism as one area in which questions had to be answered. No one was exempt from these tests which promoted Nazi dogma, and school-age children's acceptance thereof was monitored.

Nazism and Darwinism: The Party of the Well-Educated

When the Nazis came to power in 1933, 51% of the party members were from the professional classes. A large number of teachers were members of the Nazi Party and were required to take an oath of "absolute fidelity to Adolf Hitler." In a similar vein, in the United States today the lower courts have consistently ruled that public school teachers are not allowed to present information against Darwinism, even information published in mainline academic journals. The obvious result is that their students believe Darwinism as solid science.

Philosophy professor Stephen Hicks concluded: "The Nazis had also achieved great success with older students, those of university age. Before Hitler came to power, Nazi student groups existed at universities all over Germany." Thus, *before* the Nazis took control of the government in 1933, "it was common for students to come to classes wearing brown shirts and swastika armbands, and in many cases, it was the most intelligent and idealistic university students who were the most active and outspoken supporters of National Socialism. These students were supported by many of their professors" (Hicks, 2010, p. 32).

When the Nazis took power, all Jews and others persons deemed racially objectionable were prohibited from holding academic positions. This policy resulted in hundreds of tenured Jewish professors, including Nobel laureates, being fired (Hicks, 2010, pp. 29, 31–32). The next step was book burning. Dr. Goebbels explained that any book which was deemed subversive to "our

future or strikes at the root of German thought" should be destroyed. Book burnings began on May 10, 1933, only a few months after the Nazis assumed power in 1933.

Massive University Book Burnings Begin

In an open square across from the University of Berlin, roughly 20,000 books were burned in a huge bonfire. At the event, Goebbels spoke to 40,000 cheering students and professors (Hicks, 2010, p. 33). Professor Hicks added that the book burnings "were not instigated by the Nazi Government. Nor were they instigated by non-intellectual thugs. The book burning was instigated by university students. The Nazi Party's *student* organization conceived and carried out book burning all across the country—book bonfires burned brightly that night in every German university city. The professors had taught their students well" (Hicks, 2010, pp. 33–34).

Factors Contributing to WWII

Germany's defeat and loss of their colonies and land, plus the humiliation of the treaty of Versailles, resulted in much resentment by the German people. These factors screamed for a resolution, but did not demand war as the solution. Nonetheless, WWII and the Holocaust are two events which, although intertwined, were separate. WWII could have occurred without the Holocaust, but the European Holocaust (outside of Germany) would not have occurred except for WWII. Germany was able to extend the Holocaust only in countries it controlled. In fact, war was a pretext to achieve the Nazi's main goal, which was the extermination of the Jews and other "inferior" races. Toward this goal, "Hitler's Germany mobilized all of its resources: bureaucratic, military, legal, scientific, economic, and intellectual" (Bergen, 2016, p. viii).

The genocidal killing of Jews in Germany and the conquered nations, produced much opposition to both the war and Hitler. A large number of persons, including high-level generals, were angry at the massive, senseless executions of Jews and others in the countries Germany controlled. Initially, many Ukrainians, Estonians, Latvians, Lithuanians, and both Western and Eastern Europe, considered the Germans as liberators from the Soviet Union. Hundreds of thousands of non-Germans fought, either voluntarily or under the influence of others, for the Nazi cause (Böhler and Gerwarth, 2017). Then, when the genocidal killings began, people formerly in favor of German rule turned against the Nazis. This fact was exploited by the Soviets and other countries. The result was that Nazism eventually failed militarily.

For these reasons, without the Holocaust, the likelihood of German war successes would have been increased. WWII alone would have had a very different outcome without social Darwinism as part of the Nazi program. Close to six million persons would have been part of the productive labor force, many would have been part of the German Army, Navy, and Luftwaffe (Air Force) instead of being killed in the camps or executed in the field. Many scientists, craftsman, and skilled laborers would have been added to the Nazi war machine. Jews as a whole served very honorably in WWI, proving their loyalty to Germany, as well as their bravery and skills. Close to 300,000 Jews served in World War I, among them were 25,000 Jewish officers. Some Jewish Mischlinge (those of mixed Jewish descent) also served in WWII (Rigg, 2002).

Some historians conclude that if Germany had not been handicapped by eugenics and racism, they would have achieved most of the territory and cooption necessary to rule most of Europe (Alexander, 2001). The main reason they invaded Russia was the Nazi firm com-

mitment to the idea of Lebensraum, the belief that superior races had not only the right, but the obligation, to overtake land inhabited by inferior races (Bergman, 2022). The Nazi goal in Russia was to kill as many Slavs as necessary to control the country, and then make the rest slaves (Hund et al., 2011, p. 25).

One example of this Lebensraum program is the 900-day-long siege of Leningrad from 1941 to 1944 that claimed the lives of one million of the city's inhabitants, mainly through cold and hunger. This number was greater than all American casualties in all of the U.S. wars combined. Historians have classified the siege of Leningrad as a genocide due to the systematic starvation and intentional destruction of the city's civilian population, whom the Nazis regarded as an inferior race (Bidlack and Lomagin, 2012, pp. 1, 36). In short, evolutionary racism—the racial views and events adopted by the Nazis—was one, if not a major, reason why Germany lost the war (Overy, 1997, pp. 284, 313, 330, 326).

Darwinian Eugenics and Nazism

The Nazi Movement's foundation was in the Darwinian eugenics movement. Dawson College professor Gabriel Tordjman observed: "The Nazi movement's ideology actually was a mixture of eugenics, social Darwinism, racism, antisemitism and the Aryan myth" (Tordjman, 2022, p. 254). Hitler had studied many eugenic publications and made it clear in his outline for the Nazi Movement in *Mein Kampf* that application of eugenics was central to his war goals (Michalczyk et al., 2022). Hitler also believed war and struggle were natural to human society because it strengthened humans by eliminating the weak—ideas cultivated from his evolutionary worldview that included "survival of the fittest."

Thus, the intellectual core of Nazism was Social Darwinism. Ironically, the

main reason Nazism failed was due to their Darwinian core—which was the main driving force behind Lebensraum (Murphy, 1997, p. 198). If the Nazis had never begun the war on Jews, Slavic people, and other non-Aryans, and never invaded Russia, they would have been more likely to have achieved more limited goals such as dominance of most of Europe.

The Central Importance of the Extermination of the Jews

One of the best examples showing that the extermination of the Jews was of central importance to Nazism was that toward the end of the war, when faced with the choice to either move supplies to the troops in Russia or ship the Jews to the concentration camps, killing Jews was the priority. Hitler believed that killing Jews was more important than losing the war. If they lost the war, at least they would have exterminated the Jews. The genocide of the Jews was the culmination of a decade of German policy under Nazi rule and the core goal of the Nazi dictator, Adolf Hitler. Hitler, against the advice of his generals, even moved the war from Britain to the East because, compared to Britain, an enormously greater number of Jews lived in the East.

Not only Hitler but the Nazi elite, including Heinrich Himmler, the Reichsführer-S.S. and the principal architect of the Holocaust, and Reinhard Heydrich, prioritized genocide over winning the war. Leading Hitler scholar, Oxford University professor Martin Holmes, has written that when German forces occupied

large swathes of Poland, Ukraine and Russia, the top priority was the murder of the Jews in those areas. The logistical needs of German forces to hold on to and administer the territory they now occupied was a secondary consideration.... this genocidal policy was highly labor intensive. It required troops who

were previously fighting on the Eastern Front or engaging in military duties throughout occupied Europe to engage in rounding up the Jews, transporting them across vast distances and murdering them on an industry scale—some six million of them in all. It requires large numbers of troops, as well as German civilians, to be involved in the running and maintenance of the concentration camps....the Holocaust required the railway network to be used for the murder of the Jews, ahead of the logistical supply of German troops in battle, irrespective of the fact that the tide of the war had turned against the Axis forces on the Eastern front from December 1941. Every train taking the Jews to the death camps was a train not transporting troops to and from the front. Because of Hitler's prioritization on the Final Solution over military victory, the German army became steadily less able to defeat the Russians. (Holmes, 2022, pp. 84–85)

Consequently, in the end, they lost the war.

Parallels Between Academe's Support of Nazism and Evolution

Parallels exist between academia's support of eugenics and Nazism in Europe during the last century and academia's support of Darwinism today. In America, well-educated scientists have accepted evolution for largely the same reasons that it was accepted in Nazi Germany. A survey by Professor Edward J. Larson and journalist Larry Witham published in the world's leading science magazine, *Nature*, found that 93 percent of the members of the National Academy of Sciences (NAS)—America's most elite body of academic scientists—are agnostics or atheists. Only seven percent believe in a personal God (Larson and Witham, 1997). According to Gallup

polls, 80 percent of Americans believe in some form of creationism, in contrast to only three percent of leading science academics (Newport, 2014).

The latest Pew study found that 97 percent of the academic scientific community accepted unguided evolution as the dominant scientific theory, not only of human origins, but of all biological diversity. This compares to 63 percent of biology professors belonging to institutions associated with the Council of Christian Colleges and Universities (CCCCU). However, only six percent taught the creation model, and just 13 percent taught that evolution was an inadequate explanation for the origin of humans (Polanski, 2018).

The leftist bias today in academia is enormous. One study, which gathered information from 12,372 professors across the United States, found that college professors donated to Democratic Party causes over Republican ones at a rate of 95-to-1 (Spencer, 2020). The ratio between Democrat and Republican donations was most pronounced in the areas of sociology, English, and anthropology. A recent Harvard Institute of Politics study found that only 35 percent of young Republicans feel comfortable sharing their political views on American campuses (Turley, 2019). In recent years, American college faculty have also faced problems for acting on right-leaning political beliefs.

Another important parallel with Nazi Germany is the requirement that evolution be the dominant worldview in all American public schools. The new biology textbooks no longer soft peddle evolution but ensure that evolution is covered in detail (Kitcher, 1982, pp. 3, 177). A clear example of this is the recent modification of biology textbooks to include evolution *throughout the entire book*, instead of just the last chapter or just one section, as was once common (Bergman, 2023). This was done to deal with the problem of instructors deliberately skipping the evolution

section. Another reason for this change was to frustrate the efforts of teachers who were not advocates of evolution, thereby forcing the evolution concept to be taught. As a result, students are indoctrinated into believing evolution is an established fact of science—similar to the indoctrination that occurred in classrooms in Nazi Germany.

The course syllabi, as well as both state and local requirements, also ensure that evolution is covered in detail (Vazquez, 2021). Furthermore, evolution is now included in other academic areas, including literature, history, psychology, and philosophy. Programs training teachers to teach evolutionism more effectively, such as Teachers Institute for Evolutionary Science (TIES), is yet another example (Vazquez, 2021). TIES has done presentations in hundreds of schools. A century ago, Europe's educational system advocated eugenics, Germany pushed Nazism, and today the United States pushes human evolution.

Even worse than indoctrinating our students in evolution as the Nazis did, the American courts have made it clear that information opposed to evolution *cannot* be covered in public school classrooms. When courts have ruled on what should be taught in science classrooms, they have consistently mandated the "evolution only" position. The courts did not base their conclusion on observable science, but rather on their secular worldview. Because most students listen to, and trust, the teaching from respected instructors, they accept it as valid. If repeatedly exposed to *evolutionary conclusions* in their many different classes which are then also promoted by the news and entertainment media, most students will accept evolution as the only valid worldview.

As was true in Nazi Germany, social pressure against non-evolutionary theories dominates academia as Shuichi Tezuka demonstrates when he says, "Young Earth creationism is widely understood as contrary to the scientific method and

is the subject of much well-deserved criticism from science educators.... encouraging the distrust of established scientific conclusions” (Tezuka, 2021, p. 3). Shuichi Tezuka (pseudonym) also refers to the creation worldview as “Science denialism.”

Some Concluding Thoughts

People with high IQ’s are important influencers of societal thought and belief. Nazis with high IQ’s shaped the thought of many Germans in the 1920s and 30s. Charles Darwin, who reportedly possessed an IQ of 140, and his fellow evolution advocates often possessed high IQ’s as well. American psychologist Catharine Morris Cox Miles found the mean IQs of scientists to be 164 (Walberg, Rasher, and Hase, 1978). High IQ persons may be emotionally tied to a philosophy (i.e., Nazism or evolutionism) even though it lacks supporting evidence. IQ tests measure the knowledge-understanding aspect of a person, but not their wisdom. As true believers, they enthusiastically promote their view to a trusting, less-informed public. High-IQ individuals are thus major influencers of societal thought and belief as were Darwin and his Nazi disciples.

Operation Paperclip

The level of talent that the German scientists and medical professionals had was so high that, in spite of their Nazi involvement, after the end of World War II the United States intelligence program brought in over 1,600 German scientists, engineers, and technicians from the former Nazi Germany to the U.S. They were all given high-level jobs with the government (Lasby, 1971; Jacobsen, 2014). America could not have achieved the enormous success in its space program without their expertise and talent. Furthermore, after 1947 some United States Intelligence

officers utilized existing so-called “rat-lines” to move certain Nazi strategists, scientists, and medical professionals to the United States and other nations, particularly in South America (Phayer, 2008). Russia was also able to obtain 150 leading German scientists to work for their space program (Cornwell, 2003, p. 424).

Summary

Prominent scholars and scientists played leading roles not only in Hitler’s rise to power, but also in the war to exterminate the Jews (Weinrich, 1999). Why did some of the most highly educated people in the world support a political party whose beliefs resulted in the worst Holocaust in history? Professors and educators in general were very active and effective in indoctrinating the people in Nazi Germany into the eugenics and inferior-race belief. The problem of indoctrination into Darwinism that occurred in Nazi Germany by the educated elite still plagues the world today. No longer is the indoctrination focused on Darwinian racism, but it is now the *total* Darwinian evolutionary worldview. This worldview has replaced theism with functional atheism and an intolerance for the Christian worldview and its values.

At the same time, all educated people should use their common sense to understand that if certain ideas are promoted by the government or leaders in the educational system, and those ideas don’t make sense according to the natural world around us that we can observe, or to the scientific method, then we need to vet those ideas as well on evidence and scientific findings, not propaganda. The reader should know that intelligent and highly educated people can fully fall into ignorant ideas if they stop thinking! This is exactly what communism does—it creates a culture where people stop thinking and just embrace whatever the government or

the “intelligentsia” or “academia” tells them they should believe.

Both Darwinian racism and Darwinian evolution promote beliefs that have caused an enormous amount of suffering (Bergman, 2019). In spite of the overwhelming evidence that has falsified evolution, this worldview is widely accepted by the brightest individuals in America, and is maintained by most people in secular academia via aggressive indoctrination and censorship.

Parallels between Nazi Germany and the evolutionary establishment are numerous and well-documented. Both the Nazis and the evolutionists dominated the universities. They have convinced the vast majority of educated people to accept their worldview, and have ensured that only their philosophical narrative is taught as scientific fact. Evolutionists hold to a worldview that is irrational, just as was the Nazis’ racism that once dominated the Nazi Movement. They have both successfully manipulated mainline media in their practice of aggressive censorship. In both cases, they have accepted an ideology that is not only harmful and woefully lacking in valid supportive evidence, but there is overwhelming and demonstrated scientific fact *against* their worldview. The Darwinian core is also one of the main drivers of intolerance in universities today (Bergman, 2008, 2012, 2013, 2016, 2018).

Most people, no matter what their IQ, have certain things in common. This includes a sense of right and wrong, national pride, love of family, and a need to seek justice. Biology had enormous prestige in the Third Reich and was effectively used to support the Nazi worldview. Likewise, Darwinism has achieved a high level of scientific respectability by providing what appears to be irrefutable scientific evidence for evolution.

Darwinian racism has been overturned, and Darwinism too will eventually be overturned due to the steady accumulation of evidence contrary to

this worldview. Søren Løvtrup, professor of embryology at the University of Umea Sweden wrote: “I believe that one day the Darwinian myth will be ranked the greatest deceit in the history of science. When this happens many people will pose the question: how did this ever happen?” (Løvtrup, 1987, p. 422).

The root causes of all atrocities in our world are based on worldviews counter to the Biblical worldview. Only Truth can “gird up” an individual/people group/educational system/country to be “make you free” (John 8:32). Intelligence on its own can damage/destroy a society, culture, country, and the individual. Intelligent people only “fall” for ignorant ideas when they stop asking questions and simply believe what they are taught in their educational systems and from their governments. All Christians should be Bereans (Acts 17:10–11) and know what Scripture teaches to support our worldview.

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Notes from the Panorama of Science

The Dinosaurs of Job 40 and 41

Introduction

One of the main purposes of Job is to call us to a firm belief in Creation and in the plan of the ages: that is, redemption; Paul's preaching always began with this in the preaching of the Gospel to the Greeks and to those not understanding special creation. This integral part of Job shows that God was the Creator and Sustainer of creation. As a part of this demonstration of God's majestic and humbling creation, Job 40 and 41 recounts a description of two now extinct and probably reptilian creatures, Behemoth and the Leviathan. Behemoth is likely a gargantuan sauropod while Leviathan is possibly a monstrous blue whale-sized ichthyosaur or mosasaur. Verse-by-verse descriptions are discussed here. Also, in this brief study, the Creation days, 5 and 6, are discussed, and important Biblical facts regarding dinosaurs (and reptilian marine beasts) are presented. These mighty fearsome beasts lead us to think of our great, terrible, and mighty God as well as our need to remember that the Lord is ever-merciful and forgiving.

The Biblical Foundations

The following is an update on standard creationist thinking regarding dinosaurs and the Christian.

1. God created the large marine reptiles and winged reptiles (pterosaurs) on Day 5, and dinosaurs and man on Day 6 of Creation Week.

In verse 21 (Genesis 1), "And God created great whales, and every living creature that moveth, which the waters brought forth abundantly, after their kind, and every winged fowl after his kind: and God saw that it was good," the

"whales" here included horrific monsters like the large marine reptiles. I note that blue whales are today's largest animal and perhaps the most massive of all time.

2. Most Dinosaurs died in the global Flood of Genesis, Chapters 7–8.

Why is this? In Genesis 6:5,7; 7:4b, we read, "And God saw that the wickedness of man was great in the earth, and that every imagination of the thoughts of his heart was only evil continually...I will cause it to rain upon the earth forty days and forty nights; and every living substance that I have made will I destroy from off the face of the earth. Genesis 7:21–23 states emphatically, "And all flesh died that moved upon the earth, both of fowl, and of cattle, and of beast, and of every creeping thing that creepeth upon the earth, and every man: All in whose nostrils was the breath of life, of all that was in the dry land, died. And every living substance was destroyed which was upon the face of the ground, both man, and cattle, and the creeping things, and the fowl of the heaven; and they were destroyed from the earth: and Noah only remained alive, and they that were with him in the ark." This was God's punishment on mankind and his dominion for his wickedness. Secular scientists do generally accept that some major catastrophe as the impact of an asteroid killed the dinosaurs. The main secular belief is that a 10–15 km asteroid struck the Yucatán Peninsula in Mexico, known as the Chicxulub crater, but this is disputed (Clarey, 2017).

The actual catastrophe, which may have involved asteroid and meteor collisions (as well as catastrophic plate

tectonics), was the Flood of Noah. 2 Peter 3:6 states, "Whereby the world that then was, being overflowed with water, perished." Certainly, without God's providential care and intervention, even of the Ark, all life would have ended. Later, most of the dinosaurs which had been taken on the Ark (young ones) died due to the climatic changes or by hunting by humans. There may have been some dinosaurs surviving from the Ark still living at Job's time for him to see and possibly even at the present time in remote regions.

3. Dinosaurs were originally plant eaters but some became carnivorous following the Curse (Genesis 1:29–30; 2:16; 9:3–5; Staubaugh, 1991).

4. Men and dinosaurs lived contemporaneously.

Most likely, juveniles or young adults were put on the Ark. The size of dinosaurs taken on the Ark only averaged 70–100 kg (154–320 pounds), or about sheep sized (Clarey and Tomkins, 2015).

5. Job had first-hand experiences with the post-Flood environment.

It is possible that Job's experiences occurred only 300 years or so after the Flood. (Job 22:15–17; Morris, 1988). The Flood was followed by a brief ice age in Northern climates making more rain and snow even in Job's now arid climate. Job 38:22 states, "Hast thou entered into the treasures of the snow? or hast thou seen the treasures of the hail." Job 38:29–30 continues, "Out of whose womb came the ice? and the hoary frost of heaven, who hath gendered it? ...and the face of the deep is frozen."

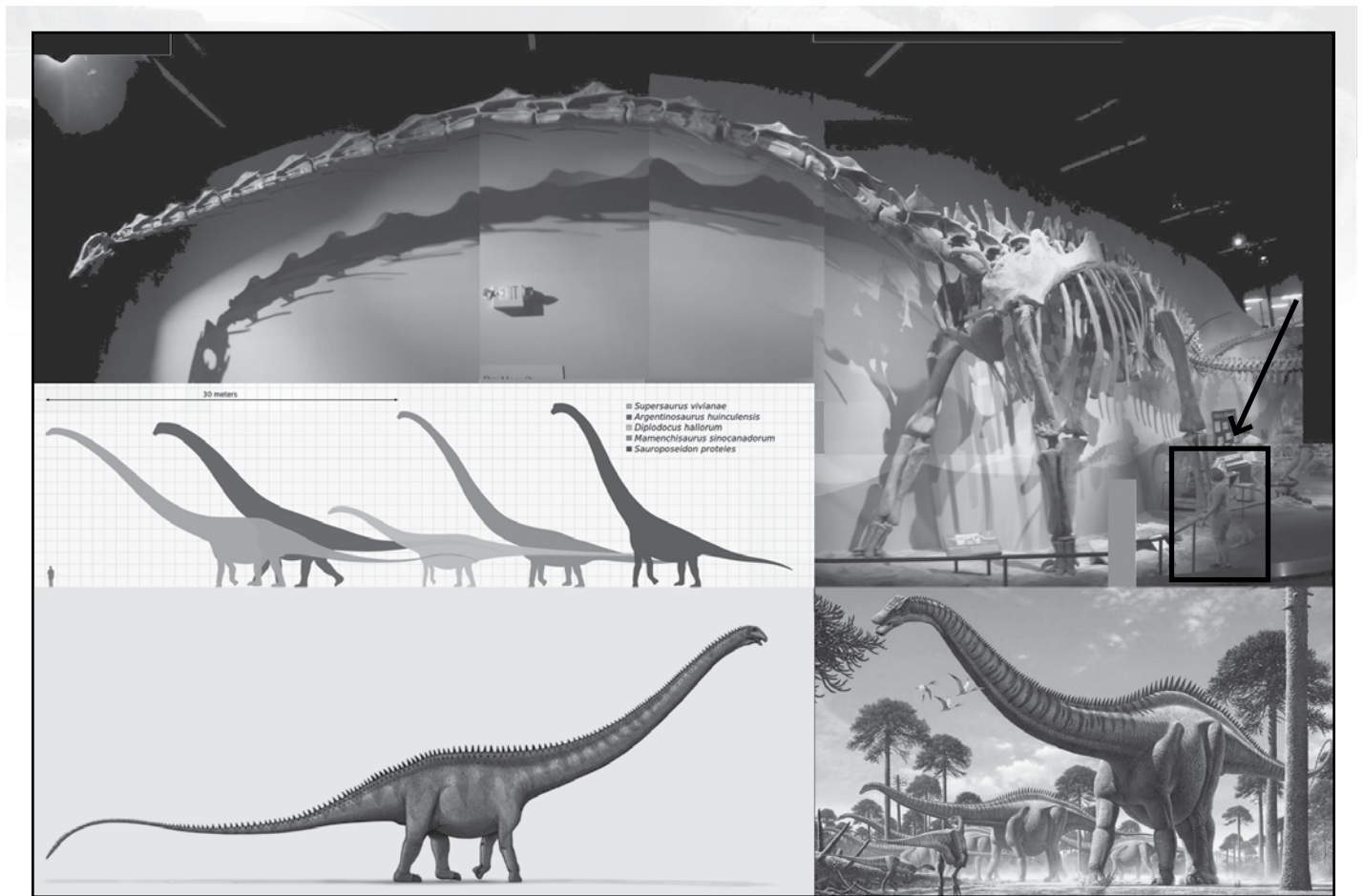


Figure 1. From the description, Behemoth is a sauropod. One of the largest sauropods unearthed is the Supersaurus. https://upload.wikimedia.org/wikipedia/commons/7/70/Supersaurus_moal.jpg.

Uz is probably in Aram in the area of Damascus (Syria) today, with a cool arid climate (dry, less than 10 inches of rain per year).

6. One of the main purposes of the book of Job is to call us to a firm belief in Creation.

One of the main purposes of Job is to call us to a firm belief in Creation and in the plan of the ages, and in redemption; Paul’s preaching always began with this in the preaching of the Gospel to the Greeks and to those not understanding special creation. This integral part of Job shows that God was the Creator and Sustainer of creation. The other was to

show Satan and the world that the real reason the Christian serves God is not selfishness—that God gives us special favor and gifts—but that the Christian loves God because he created us, loves us unconditionally, and because He gave Himself for us on the Cross.

The Introduction to the Discussion (Job 40:1–15): God Confronts Job from a Whirlwind

In the previous chapters, 38 and 39, God speaks directly to Job. He tells about the wonders of nature that he has created. He talks with him about the heavens and his animals. Job was a true man

of God. He served the Lord with his whole heart, and had a good testimony. He revered God, and he humbled himself before God. But don’t think for one moment that Job was without sin. He was a sinner like all of us. In his conversations,

- 1) He complained to God. (Job 19:7–12)
- 2) He presumed that God was mistreating him. (Job 16:6–7)
- 3) Job acted like he knew more than God: He hoped God would let him defend himself and set Him straight. (Job 23:1–9)

But when he was confronted with the majesty and intricacy of creation and the

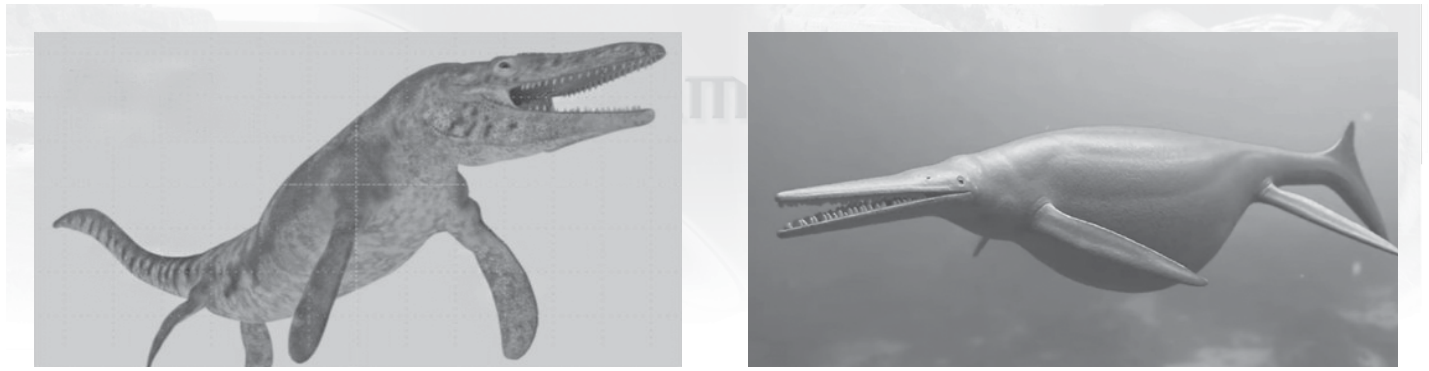


Figure 2. Mosasaur on left. On right is the *Stenopterygius quadriscissus* or “Lil stock Monster” (largest ichthyosaurs, length: 120’; larger than blue whales).

purpose it implies, his problems become insignificant and his own complaints and questions, frivolous. Job could only acknowledge his vileness and could no longer defend his righteousness. He awaited further instruction as God gave a revelation of two of the fearsome animals of creation—Behemoth and Leviathan. He spends nearly two chapters (40, 41) telling him about two beasts, the most fearsome beasts of all time (Job 40:19—“He is the chief of the ways of God,” but now extinct).

Behemoth, Job 40

Verse 40:15 declares, “Behold now behemoth, which I made with thee [He was created the same day as man]; he eateth grass as an ox.” The Behemoth is described here as a vegetarian. Verse 16 declares, “Lo now, his strength is in his loins, and his force is in his stomach muscles.” It is muscular and powerful. Verse 17 says, “He moveth his tail like a cedar: the sinews of his thighs are tightly knit.” It has a long strong tail which swings about like a stiff cedar tree rather than a snake. This is used to identify the beast as a sauropod. Verse 18, “His bones are as strong pieces of brass; his ribs are like bars of iron.” His bones and ribs are like bars of brass and steel. “He is the chief of the ways of God,” (alive then, now extinct:), “he that made him can make his sword to approach unto



Figure 3. *Spinosaurus* depiction, in usual habitat (coastal waters).

him.” He is largest or chief of God’s land animals. Only God could slay or trap him. God would not allow dinosaurs to proliferate with man since they could destroy him from off the Earth. Verse 20 states, “Surely the mountains

bring him forth food, where all the beasts of the field play.” This dinosaur eats tons of food each day, mountains are his playgrounds. He likely runs in packs, groups, or herds. Verse 21 recounts, “He lieth under the shady trees, in the



Figure 4. Ferocious teeth of a mosasaur. (A giant *Tylosaurus proriger* mosasaur on display at the Academy of Natural Sciences of Philadelphia.)



Figure 5. Eyes of Ichthyosaurus. https://www.reddit.com/r/Nature_wasmetal/comments/feeyuu/eye_of_the_ichthyosaur/.

covert of the reed, and fens.” (The word, “fens” is בצה or bitstsâh which means “marsh,” or “marshy places.”) Verse 22, “The shady trees cover him with their shadow; the willows of the brook compass him about.” He dwells in the deep jungle, in marshy areas. Verse 23 states, “Behold, he drinketh up a river, and hasteth not: he trusteth that he can draw up Jordan into his mouth.” He drinks great amounts of water and is unconcerned with rapids. He is definitely a land dweller. Sauropods have a distinctly



Figure 6. Bombardier Beetle spraying high temperature jet of gas. <https://www.youtube.com/watch?v=W3sxJNt8CYw>.

long and muscular tail, long necks, massive elephant-like bodies and legs, and relatively small heads. This appears to be the beasts referred to here.

The Leviathan Job 41

Editor’s comment: Although there is no way to know exactly what leviathan was, previous authors have speculated it was a *Spinosaurus* (Clarey, 2015) or a *Deinosuchus* (Thomas and Biddle, 2023). Clarey makes the case that Leviathan like the *Spinosaurus* was a semi-aquatic reptile. See Figure 3.

(Here, the author shows that the mosasaur has some attributes [like the fossilized skin of a crocodile] yet is an ocean-going reptile, *Ichthyosaurus* has the fantastically large eyes as mentioned in Scripture and has the gigantic size. I regard the *Spinosaurus* as a coastal marsh-dwelling dinosaur. See the following.)

Job 41:1 recounts, “Canst thou draw out leviathan with an hook? or his tongue with a cord which thou lettest down?” Psalms 104:26 recounts, “There go the ships: there is that leviathan, whom thou hast made to play therein.” Leviathan is

a great marine reptile. Job 41:6 notes, “Shall the companions make a banquet of him? shall they part him among the merchants?” This beast would provide a great seafood banquet. Verse 7 states, “Canst thou fill his skin with barbed irons? or his head with fish spears?” This beast is impossible to catch! Verse 4 to 5 says, “Who can open the doors of his face? his teeth are terrible roundabout. His scales are his pride, shut up together as with a close seal.”

It has a great mouth, jaws, teeth, and is tightly scaled, Figure 4. Verse 18 states, “By his neesings (sneezings) a light doth shine, and his eyes are like the eyelids of the morning.” It has great eyes (The *Ichthyosaurus* has 11-inch eyes. See Figure 5.). Does this refer to bioluminescence or fire? Verse 19 says, “Out of his mouth go burning lamps, and sparks of fire leap out.

Verses 20–21 states, “Out of his nostrils goeth smoke, as out of a seething pot or caldron. His breath kindleth coals, and a flame goeth out of his mouth.” How could an animal be fire breathing? There is a beetle called the bombardier beetle. This beetle is a native of Central



Figure 7. Skin of a Tylosaurus (large 15-m Mosasaur). https://en.wikipedia.org/wiki/Mosasaur#/media/File:Tylosaurus_skin.jpg.

America, and has a nozzle in its hind end that acts like a little flame thrower. It sprays a high-temperature jet of gas (fueled by hydroquinones and hydrogen peroxide with oxidative enzymes) for protection. Now, if a Central American beetle has a built-in flame thrower, so could Leviathan! (See Figure 6.)

The history of every culture is filled with stories of fire-breathing dragons. Many fossil dinosaur skulls contain unexplained, empty passages. Scientists have not been able to guess the reason for these passages. Would it make sense that some dinosaurs used these passages as “gas tanks” for the combustible mixture used to breathe smoke and fire?

Job 41:25 states, “When he raiseth up himself, the mighty are afraid: by reason of breakings they purify themselves.” The Leviathan has tremendous size. When he rises out of the water, he is a fearful sight! Verse 27 states, “He esteemeth iron as straw, and brass as rotten wood.” Verse 26 says, “Darts are counted as stubble: he laugheth at the shaking of a spear.” He is very powerful, fearless, fearsome. Verse 30 says, “Sharp stones are under him: he spreadeth sharp

pointed things upon the mire. Its skin is such that he can rest on sharp surfaces and leave impressions. Skin impressions of an ichthyosaur appear to be rough and scaly. (Figures 7 and 8.)

A statement is given about the mosasaur skin in the scientific journal *Biology Letters*: “The dermal cover comprises keeled and possibly osteoderm (armor like skin and bones)-reinforced scales that presumably contributed to an anterior–posterior channeling of the water flow and a reduction of microturbulent burst activities along the surface of the skin” (Lindgren et al., 2009). This skin is noted on present-day crocodiles.

Verses 31–32 say, “He maketh the deep to boil like a pot: he maketh the sea like a pot of ointment. He maketh a path to shine after him; one would think the deep to be hoary.” He has bioluminescence. “Upon earth there is not his like, who is made without fear.” He is the most ferocious, fearless beast on earth. Isaiah 27:1 states, “In that day the LORD with his sore and great and strong sword shall punish leviathan the piercing serpent, even leviathan that crooked serpent; and he shall slay the dragon that

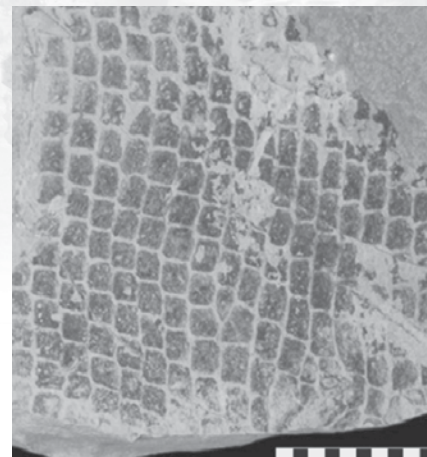


Figure 8. Mosasaur skin. (100 cm scale). Scales from a claimed 85 million-year-old mosasaur; Bo Pagh Schultz / Johan Lindgren / Johan A. Gren. *Science News*, 9 January 2014.

is in the sea.” He is a sea-going reptile, a dragon. A mosasaur reproduction is given in Figure 9.

The Purpose of These Terrible Creatures

When we think of the mighty fearsome beasts we need to think of our great and terrible, mighty God! John R. Rice (1977) has said, “We ought to fear the dreadful and terrible God.” Nehemiah 9:32a says, “Now therefore, our God, the great, the mighty, and the terrible God,” Deuteronomy 7:21 states, “Thou shalt not be afraid at them: for the Lord thy God is among you, a mighty God and terrible.” Deuteronomy 10:17 states, “For the Lord your God is God of gods, and Lord of lords, a great God, a mighty, and a terrible, which regardeth not persons, nor taketh reward:” Hebrews 10:31 states, “It is a fearful thing to fall into the hands of the living God.” Proverbs 1:7 says, “The fear of the Lord is the beginning of knowledge: but fools despise wisdom and instruction.” But we also need to remember the Lord is ever-merciful and forgiving. Psalm 103:8,10 says, “The LORD is merciful and gracious, slow

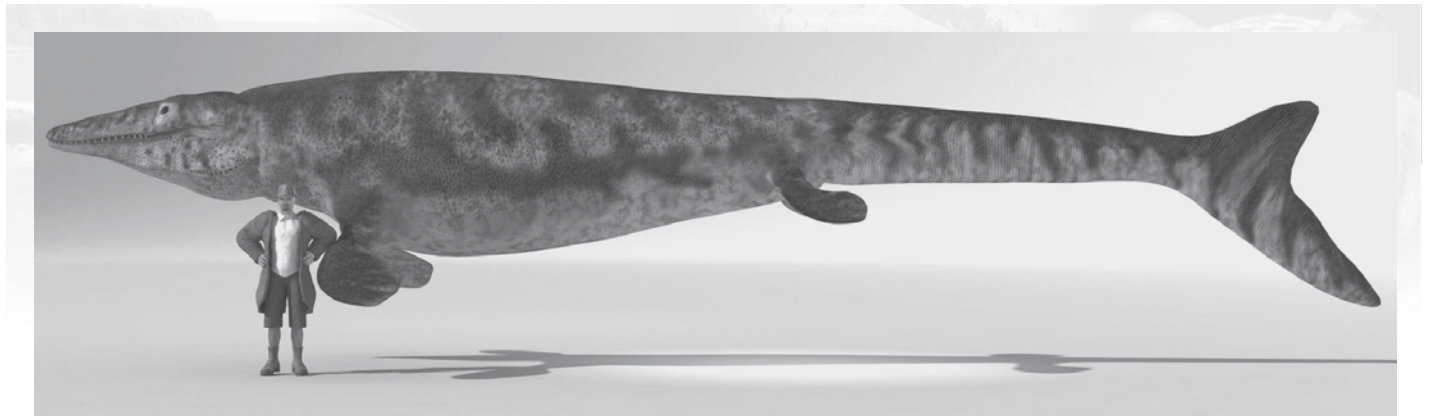


Figure 9. The mosasaur (reached lengths up to 57 feet) compared to a man like Job. <https://www.fossilera.com/pages/how-large-did-mosasaurs-get>.

to anger, and plenteous in mercy. He hath not dealt with us after our sins; nor rewarded us according to our iniquities.” But regardless, Jesus Christ, our Savior, is the mighty Creator God.

Ronald G. Samec, Ph.D.
Retired. Former Professor,
Bob Jones University;
Professional Astronomer

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Bird Nest Lessons: Creation Perspectives in Avian Ecology

There shall the great owl make her nest, and lay, and hatch, and gather under her shadow. (Isaiah 34:15a)

NEST—this simple word “nest” represents an enormously important part of a bird’s early life, as well as critical times in the life of a bird family.

A baby bird’s beginning is experienced inside a nest. From embryonic egg to hatchling, from hatchling to fledgling, a baby bird’s life adventures are “hatched” inside a nest of some kind. Consequently, nests are the childhood homes to young nestling birds, plus parent birds repeat their multi-generational nest life as they reproduce and nurture the next generation of their own kind.

For most birds, springtime means mating, and mating time means nesting. As soon as nesting begins in earnest, everything changes. The earth becomes quieter, the sight of a bird [displaying to attract a prospective mate] rarer. Despite the seeming tranquility, there’s much ado and excitement among the birds. The joy of expressing the springtime, of finding or reclaiming a mate, has been exchanged for the silence and secrecy of very private moments as birds begin the work of creating their homes. (Cohen, 1993, p. 7)

Do you recall the first times you ever saw a bird nest, close up? Did you realize, then, that the nest was “home” to the birds who resided therein?

And what a variety of nests there are, because God has programmed different birds to build and indwell different types of nests!

The variety of nests in the world of birds is fascinating. Numerous species build elaborate structures. The Dark-necked Tailorbird (*Orthotomus*

atrogularis) builds its nest out of vegetable matter inside two leaves sewn together or in a single large leaf that is also sewn up with a thin length of thread; weaverbirds, and in particular the Sociable Weaverbirds (*Philetarius socius*), build large collective nests....certain Australian moundbirds (*Megapodidae*) build huge nests of earth and vegetable matter, using the heat produced as it decomposes to incubate the [compost-buried] eggs. Many species build rudimentary nests, others lay their eggs on the ground, in sand and among pebbles....The nest is a structure used almost exclusively for reproductive purposes [or as a resting-place]....The influences of the hormonal system combined with the physiological changes that take place in the bird’s body in the reproductive period determine the construction of the nest. The choice of the site, the materials used and the time taken to build it, and the activity of the male or female in the construction, all vary from species to species. (Bologna, 1981, pp. 39–42)

These nests must accommodate the bird family’s collective weight and activities, as well as tolerate foul weather, such as winds and precipitation. Of course, nests constructed upon or inside the ground, such as the mound-nests of the Megapode “incubator bird” (Martin, 1994, pp. 43–46), need not be concerned with the weight of the nest.

Some nests are mere scrapes upon a strategic patch of ground. The Arctic Tern (*Sterna paradisaea*) is famous for its record-breaking migration treks, from the Arctic regions to the Antarctic regions, and vice versa (Egevang et al., 2010, p. 2078), so the Arctic Tern cannot afford a nest-building habit, during its breeding season (in the Arctic), that would invest too much time or material in nest-building.

Since the Arctic summer is so brief, a simple scrape that does not shorten brooding time is the best solution (Cohen, 1993, p. 46).

Other bird nests are burrowed underground or into the side of a muddy riverbank (Peterson and Chalif, 1973, p. 112; Cohen, 1993, pp. 50–53). In Texas prairies, for example, one such underground-dwelling bird is the Burrowing Owl (*Speotyto cunicularia*).

One of the strangest and most beguiling members of the owl family is the burrowing owl. It lives in a hole in the ground, often on a treeless prairie or desert, and is most frequently seen standing beside its burrow or perched on a nearby fence post....These charming little owls breed locally in the [Texas] Panhandle and West Texas, frequently associated with prairie dog villages, where they [i.e., the burrowing owls] utilize the ready-made burrows and tunnel systems. Others adapt abandoned homes of ground squirrels and pocket gophers, enlarging them by kicking dirt backwards with their feet. (Tveten, 1993, p. 173)

Many are designed to be camouflaged or otherwise hidden. Some such tree cavities are claimed by house wrens or certain types of owls, after they are



abandoned by the original tree-hole excavators (Bologna, 1981, pp. 52, 418; Cohen, 1993, p. 58). However, other tree-cavity nests are the products of the birds who inhabit them after they peck them into existence, in the sides of trees or cacti (Shunk, 2016, p. 15), such as tree-cavity nests of the Pileated Woodpecker (*Dryocopus pileatus*).

For secrecy, few hiding places can compare to a tree cavity.... Usually, the foliage of surrounding trees provides ample camouflage; sometimes height is the great advantage. No matter the case, birds nesting in tree cavities are safe from most predators—except tree-climbing snakes and an occasional agile mammal. A tree must be large and structurally sound enough to support a cavity, especially when carved by the Pileated Woodpecker [*Dryocopus pileatus*]. The Pileated digs a hollow up to two feet into the tree, although the 3½-inch entranceway is only a fraction [of] that size. The Pileated Woodpecker is [providentially] equipped with one of the strongest beaks of all birds, yet excavating comes as no easy chore. The process takes days, and is completed mostly by the male with some assistance from his mate. Many choose dead trees, but even so their efforts may be frustrated by a particularly recalcitrant tree. (Quoting Cohen, 1993, p. 54)

Some bird nests are tree-nestled demitasses, such as large cup-shaped nests of the American Crow (*Corvus brachyrhynchos*), the medium-sized cup-nests of the Magnolia Warbler (*Dendroica magnolia*), and the fragile mini-nests of most hummingbirds, including the Rufous Hummingbird (*Selasphorus rufus*).

RUFOUS HUMMINGBIRD: Nest of downy plant fibers and moss, covered with lichens, held together with spider's silk; placed on downward-sloping limb of tree or shrub. (Stokes and Stokes, 1996, p. 263)

Even the most careful observer would be challenged to locate a hummingbird's nest. This smallest of [bird] nests is nearly impossible to find, not only because of its size [~2 inches diameter/width of nest exterior, with ~1 inch diameter/width of nest's inner cup], but as a result of the plant camouflage the female incorporates into the structure. Because of the importance of camouflage, males are not welcome visitors to the hummingbird nest. Their bright colors draw too much attention and might endanger the offspring, so they take no part in nest-building, incubation, or chick-rearing. Often they return after the chicks are fledged and help produce a second brood in the same season.... Not every bird could manage a cup nest. Because of the high walls [which prevent the nestling young from tumbling out by accident], a cup must be entered from above, a feat best accomplished by skilled aviators such as songbirds. Master of wing control [as demonstrated by multi-directional flight and hovering], the hummingbird is a natural cup nester. (Cohen, 1993, p. 64)

Since hummingbirds are tiny birds, it is unsurprising that their nests are likewise (relatively) tiny. However, hatchling hummingbird young do more than eat in those tiny nests—they also learn about life, especially from parental teaching:

The staff at ICR trusts you enjoy the hummingbird picture taken outside a window of our main building. It was noticed months ago that an adult bird was weaving a nest on a palm frond. Being a science organization and lovers of God's living creation, we closely followed the maternal events as they unfolded. The tiny eggs hatched and in due time, the two rapidly-growing hatchlings were literally bursting from the confines of their nest. It was interesting that the mother, perched on

a nearby branch (always the same one), would intently watch her little ones in the nest. She would occasionally zoom around the nest, showing her crouching, bewildered offspring that "this is how you do it!" (Sherwin, 2006)

Other bird nests are quite roomy, resembling hanging sacks or book-bags, such as the pocket-like sack-nest of the Baltimore Oriole (*Icterus galbula*).

Orioles are as well known for their nests as they are for any other aspect of their behavior. The nest is a long woven sack, suspended from the tip of a drooping branch. These nests are obvious in winter, especially hanging over roads, and it's always interesting to see how many Orioles actually nested in your area, even though you were unaware of them during the breeding season [which is when the Orioles' family privacy is most important!]. Usually the female builds the nest. First a few long fibers are attached to the branch and looped underneath. After that, she brings other fibers one at a time and pushes them through one side, and then arbitrarily pulls fibers in from the other side. The actions [appear] random.... [yet] she gradually creates a suspended mass of material. Then, entering from near the top, she lines it with soft material such as feathers, grasses, wool, and dandelion or willow fuzz. The nest can take from five to eight or more days to complete. Orioles usually build a new nest each year, but in some instances they have been known to repair old nests. When building a new nest, they frequently take [and recycle] material from one of their old nests or some other bird's nest. (Stokes and Stokes, 1983, p. 231)

Some bird nests are mostly reshaped mud, such as the pottery-like mud-nest of the Rufous Ovenbird (*Furnarius rufus*), the Cliff Swallow (*Hirundo pyrrhonota*), the Bank Swallow (*Riparia riparia*), and

the Greater Flamingo (*Phoenicopterus ruber*).

BANK SWALLOW (a/k/a **SAND MARTIN**): It usually nests near water in holes in steep banks [e.g., inside a nesting hole within a muddy riverbank], either natural or artificial, of earth or sand. The hole is made by both adults and ends in a wider space [e.g., a pocketed riparian mud-bank cavity], where the female lays clutches of 3–7 eggs (most often 4 or 5). Both sexes incubate the eggs for 12–16 days. The nidicolous [i.e., nesting for a long time before fledging] nestlings are reared by both parents and stay in the nest for about 19 days [which is a relatively long time before fledging]. They feed on flying insects. (Bologna, 1981, p. 353)

Mud is an excellent choice of nesting material. When it is cemented into place, mud creates a sturdy nest that is nearly impermeable to any threat but rain, at least for the time needed to raise a family of chicks. Cliff Swallows (*Hirundo pyrrhonota*) build their nests as do most other mud-nesters, in stages. As many as one thousand [1,000!] mud pellets, each carried separately to the site and placed in layers, are needed to complete the task. Before each succeeding [mud-nest] layer can be added, the previous one must dry completely [unlike brick masonry courses constructed by human bricklayers!]. Too much weight, and the nest could topple over. The whole task needs about two weeks to complete and may take even longer during periods of drought or too much rain. A mud hole seems almost alive when dozens of Cliff Swallows are jockeying for the choicest mud they can find. (Cohen, 1993, p. 74)

Some bird nests are located on shorelines of freshwater or brackish water, such as nests of Great Blue Heron (*Ardea herodias*) and nests of Common Loon (*Gavia immer*). Likewise, some bird

nests are located on oceanic beaches and rocky seashore cliffsides, such as nests of Red-legged Kittiwakes (*Rissa brevirostris*) and nests of Thick-billed Murres (*Uria lomvia*).

Many aquatic birds build their nests very close to or just on top of the water. Some birds, such as coots, build their own private nest islands on the water, while grebes anchor floating platforms to a nearby water plant. As long as the eggs stay dry (and out of the jaws of a predator), the unhatched chicks remain safe.... Though loons fish in both fresh and salt water, they nest near fresh water [usually lentic freshwater, such as ponds and lakes] only. Free of the currents and tidal motion of seawater, the calmer waters of inland lakes are easier for neonates to negotiate while learning the diving techniques crucial for their adult survival. (Cohen, 1993, p. 78)

The [Common Loon] nests are usually sheltered by surrounding vegetation and upon first being built are right at the water's edge. Nests are built of earth, grasses, moss, [and/or] dense floating vegetation. Little in the way of a nest is built before the eggs are laid. The nest at this time is usually only a little depression in the substrate with a small amount of [added] material collected around it. (Stokes and Stokes, 1989, p. 18)

They [i.e., Double-crested Cormorants] nest in colonies, their stick nests usually in cottonwoods near or over water. Cormorants are abundant on the lakes and reservoirs of eastern Colorado in summer; a few remain in winter. (Gray, 1998, p. 27)

Some bird nests are in rocks, often at high altitudes.

The vivid description in [verses 27–28 of] Job 39 must surely refer to the griffon-vulture [*Gyps fulvus*]: ‘Doth the eagle mount up at thy command, and make her nest on high? She dwelleth and abideth on

the rock, upon the crag of the rock, and the strong place.’ This passage well describes a typical nesting-site. (Cansdale, 1976, p. 144)

The size of Bald Eagle (*Haliaeetus leucocephalus*) nests [called aeries] is impressive—some eagle nests are built to colossal sizes, more than 12 feet deep, 8 feet wide, and weighing up to a ton! (Cohen, 1993, pp. 62–63).

The Bald Eagle (*Haliaeetus leucocephalus*) uses a platform nest as its base and then builds a more complicated cup nest into the surface. If disturbed during egg-laying or early chick-rearing, a Bald Eagle pair may abandon its nest. (Cohen, 1993, p. 62)

Eagles—like many other territorial birds of prey—often nest far from other eagles, yet this is obviously not characteristic of Bald Eagle populations along the coasts of Southeastern Alaska (Kavanaugh, 1997, p. 59; personal observations during summer itineraries aboard cruise ships, serving as historian/naturalist, during AD 2000, AD 2001, and after).

Thousands [of Bald Eagles, migrating seasonally to the Alaska Chilkat Bald Eagle Preserve] congregate to feed on spawning salmon in the Chilkat [River] Valley in autumn and early winter. (Kavanaugh, 1997, p. 59)

Many bird populations nest in colonies, with some wading bird colonies called “rookeries” (Griggs, 1997, p. 41), in keeping with other gregarious habits that justify the old saying: “birds of a feather flock together.” Such gregarious behavior certainly includes the wonderful icterids we call grackles, often seen congregating in or above parking lots, such as the Common Grackle (*Quiscalus quiscula*) and the Great-tailed Grackle (*Quiscalus mexicanus*).

Grackle nest-building may occur over a period of up to six weeks or even more, and in these extended cases seems to be closely tied with pair formation. Grackles are some-

what colonial in their nesting habits, many pairs often nesting in the same area. After a pair have become established they spend most of their time at a breeding site, first just exploring: visiting old nests and hopping about prospective nest sites. During these activities [as with similar activities by human pairs] the female is always in the lead. (Stokes, 1979, p. 296)

Thus, for God's multitude of bird varieties, God programmed those birds to make and to use a prodigious variety of bird nests. This fits God's Genesis 1:22b mandate, for birds to be fruitful, multiply, and fill the earth—because biodiversity is enhanced by a variety of habitats to house that biodiversity (Johnson, 2012a, pp. 10–12).

Many bird nests (such as hummingbird nests) go unnoticed by human eyes, yet our Heavenly Father always notices and cares about bird nests, everywhere and at all times, because He cares about the birds whose needs are met by those nests.

Are not two sparrows sold for a farthing? And one of them shall not fall on the ground without your Father. (Matthew 10:29)

The diversity of avian nesting habits displays God's love for variety (Johnson, 2012b, pp. 8–9), as one would expect, since we see countless proofs of God's love of variety in how animals (including birds of all kinds) are fruitful, multiply, and fill niches all over the earth (Johnson, 2012a, pp. 10–12).

Accordingly, expect to find variety in bird nests.

A hummingbird hovers over a spider's web, spending several seconds latching onto a thread of silk [to be incorporated as stabilizing material for the hummer's coin-sized nest]. A woodpecker suspends his tree-drumming and instead works on excavating a nest hole with his mate. A shorebird slinks into a quiet area unnoticed and lays her single egg on [a strategically selected patch of]

bare sand. In the privacy of their own world[s], often far beyond human ken, birds settle down to build their nests and breed young. (Cohen, 1993, p. 7)

The importance of bird nests is no surprise, because nest life is at the heart of a bird population's critical habitat. Nest life is where a parental generation of birds facilitate the launching of the next (i.e., filial) generation of those birds (Bologna, 1981, pp. 37–45; Cohen, 1993, pp. 7–8).

But, the physiology of birds requires a nest life that differs from many non-birds, because birds (including pre-hatched birds) are warm-blooded animals.

What makes birds different from other egg-laying creatures is that the embryo inside each egg is as warm-blooded as a human, and like a human, requires the warmth provided by its parent, or by an adequate substitute, to develop and to thrive. Because it is so fragile, the egg must be coddled in a secure place until its occupant is ready to leave and face the rigors of the outside world. Encased in its [calcium carbonate-structured] shell, the tiny chick's only hope is that its parents [or foster-parents] do know what is best. The nest the adult birds provide furnishes the warmth and protection necessary for the chicks' survival. (Cohen, 1993, p. 8)

Nests are so important, because God made them to have useful value, so we should expect them to be mentioned within the HOLY BIBLE's pages. And, sure enough, the holy Scriptures refer to bird nests, repeatedly. A few such examples follow.

Before reviewing those examples, however, it is worth noticing that the usual Hebrew noun translated “nest” is *qên*, which first appears in Genesis 6:14 (referring to “homes” aboard Noah's Ark), where the King James Version of the English Bible translates it as “rooms.” Yet, even in that Ark housing context, a

qên was one of many temporal “homes” (i.e., onboard chambers, like “cabins” or “staterooms” within an ocean-faring cruise ship), used for security and protection from hostile external conditions.

Based upon etymologically related Hebrew words, it appears that the underlying connotation is the idea of *specifically claimed property* (i.e., acquired and possessed as “private” property) that *belongs to* a specific individual, or to a specific group (such as a specific family).

Accordingly, the Hebrew words for “nest” (both as a noun and as a verb) denote the structural home of a bird family, that belongs to that bird family—the family nest is *specifically claimed property* (i.e., acquired and possessed as “private” property), situated within the bird family's ecological neighborhood.

1. Location, location, location: where you nest matters!

Where a bird nest is positioned is important. Maybe the best place for a nest—such as an Osprey nest—is high upon a relatively inaccessible rocky cliff-top, or within the higher branches of a tall tree (Stokes and Stokes, 1989, p. 163).

And he looked on the Kenites, and took up his parable, and said, ‘Strong is thy dwelling-place, and thou puttest [i.e., you position] thy nest in a rock.’ (Numbers 24:21, with “nest” [*qên*] as noun.)

And for many large birds of prey, such as eagles, nesting in high places is the way to go. (Perhaps such birds feel “high and mighty”!)

Thy terribleness hath deceived thee, and the pride of thine heart, O thou that dwellest in the clefts of the rock, who holds the height of the hill; though thou shouldst make thy nest as high as the eagle, I will bring thee down from thence, saith the LORD. (Jeremiah 49:16, with “nest” [*qên*] as noun.)

Though thou exalt thyself as the eagle, and though thou set thy nest among the stars, thence will I bring

thee down, saith the LORD. (Obadiah 1:4)

Woe to him that covets an evil covetousness to his house, that he may set his nest on high, that he may be delivered from the power of evil! (Habakkuk 2:9, with “nest” [*qên*] as noun.)

No need for humans to feel “high and mighty”—God resists the proud but he upholds the humble-hearted. (And pride routinely “goeth” before a fall.)

2. Multi-generational reproductive success is priority!

Birds of prey include hawks, eagles, owls, and more. Yet birds themselves are often prey to predators of many kinds, including humans who eat birds, both domesticated and wild—such as chicken, turkey, goose, and the eggs of many kinds of birds. But if one generation of predators greedily consumes all of a prey population, the next generation of those predators would be deprived of a food source, which would be harmful to both the predator population and the prey population. Accordingly, it is good for a generation of predators to only eat a limited amount of a prey population, so that future generations of both predators and prey can benefit (from continued reproductive success of the prey population). That stewardship principle—applying restraint in lieu of greedy wastefulness—is what Moses commanded the Israelites as a conservation law for their future entry into and settlement in the Promised Land of Canaan.

If a bird’s nest chance to be before thee in the way in any tree, or on the ground, whether they be young ones, or eggs, and the mother sitting upon the young, or upon the eggs, thou shalt not take the mother with the young; but thou shalt in any wise let the mother go, and take the young to thee; that it may be well with thee, and that thou mayest prolong days. (Deuteronomy 22:6–7, with “nest” [*qên*] as noun.)

3. Nests are where good parenting is needed!

How eagle parents treat their young has been a subject of some confusion over the years, due to a less-than-clear-and-accurate translation of Deuteronomy 32:11. That confusion has already been addressed in an earlier article (Johnson, 2020, pp. 57–59) examining that all-too-often misinterpreted passage, so that discussion will not be repeated here.

Suffice it to say, here, that eagle parents care for their young! Like many (but not all) animal parents, eagle parents go to great efforts to raise their nestling children, training them, from hatchlings unto fledglings, for their future lives.

As an eagle, he [i.e., God, in relation to His people Israel] stirs up his [i.e., God’s] nest, he [i.e., God] flutters over his [i.e., God’s] young, he [i.e., God] spreads abroad his [i.e., God’s] wings, he [i.e., God] taketh them, he [i.e., God] bears them [i.e., the Israelites as God’s people] on his [i.e., God’s] wings.... (Deuteronomy 32:11, literal translation, with editorial clarifications, with “nest” [*qên*] as a metaphoric noun.)

This is comparable to how the Lord Jesus Christ compared His willingness to protect Jews to a mother hen’s protectiveness, as demonstrated in her welcoming and refuge-providing wingspread, noted in Matthew 23:37 and also in Luke 13:34.

4. Nests should be places of domestic security: “home sweet home.”

Then I said, I shall die in my nest, and I shall multiply my days as the sand. (Job 29:18, with “nest” [*qên*] as noun.)

The patriarch Job, unto his “friendly” counsellors, once lamented his former life of blessing, before his torturous trials were suddenly dumped upon his head. Job related how he expected to live a long life of uninterrupted blessing, ultimately dying at peace in his own

“nest” (i.e., “home sweet home”). But, God had other plans—ultimately better (albeit bumpier) plans for Job’s earthly pilgrimage.

5. The ability, of birds to make nests, is God-given, i.e., God-programmed.

Doth the eagle mount up at thy command, and make her nest on high? (Job 39:27, with “nest” [*qên*] as noun.)

The eagle was designed (i.e., pre-programmed) with built-in abilities and inclinations, endowed at creation by the Lord Jesus Christ, to make its nest in high places (Obadiah 1:4), and to mount up into the air using thermal air currents.

The eagle did not invent these purposeful traits; God designed the eagle’s physical traits and its pre-programmed abilities, including the *know-how* (and the *how-to*) needed for successfully building aeries atop high montane places or in tall trees. For more on this Scripture about eagle behavior, see an earlier CRSQ article (Johnson, 2021, p. 290).

6. Nests are for raising children, i.e., the next generation.

Yea, the sparrow hath found a house, and the swallow a nest for herself, where she may lay her young, even thine altars, O LORD of hosts, my King, and my God. (Psalm 84:3, with “nest” [*qên*] as noun.)

Notice that the sparrow’s “house” is parallel in meaning to the “nest” of the swallow. In other words, a “nest” is a “house” for dwelling in, and especially for raising young in.

7. Particular types of nests are selected according to who will be living therein.

Where the birds make their nests: as for the stork, the fir trees are her house. (Psalm 104:17, with “nest” [*qânân*] as verb.)

In the above-quoted psalm we are reminded that storks are known to make their homes within the branches of fir trees. Storks are also known as predictable migrants—see Jeremiah 8:7 (Johnson, 2013).

8. Wandering from the security of the nest can lead to many dangers.

As a bird that wanders from her nest, so is a man that wanders from his place. (Proverbs 27:8, with “nest” [*qên*] as noun.)

For it shall be, that, as a wandering bird cast out of the nest, so the daughters of Moab shall be at the fords of Arnon. (Isaiah 16:2, with “nest” [*qên*] as noun.)

One of the advantages of many bird nests is camouflage—being hidden from the sight of hungry predators.

There is a security that comes with staying inside one’s proper home. Not that any home (or nest) is “bulletproof” from danger, but there are often many more dangers lurking about, the farther that one wanders away from home. (The same is true for young who are expelled from home.)

Consequently, the high mortality rate is why birds routinely try to raise more hatchlings than themselves.

In other words, two parent birds need to strive for replacing themselves with more than just two children, in order to mitigate the risks that their progeny will become prey (literally “dead meat”) before they can successfully reproduce the next generation.

[The overall concept of multi-generational replacement, as a matter of population biology, is discussed in “Post-Flood Repopulation: From 8 to 8,000,000,000!” posted at www.icr.org/article/post-flood-repopulation-from-8-8000000000.]

9. Bird eggs are a valuable source of good (i.e., nutritionally rich) food.

And my hand hath found as a nest the riches of the people: and as one

gathers eggs that are left, have I gathered all the earth; and there was none that moved the wing, or opened the mouth, or peeped. (Isaiah 10:14, with “nest” [*qên*] as noun.)

Isaiah stated the obvious—eggs are valuable; in fact, they are like a store of “riches,” nutritionally speaking. This nutrition fact concurs with the mention of eggs as a “good” food, in contrast to bad food. See Luke 11:11–13, where giving eggs to eat is recognized (by Christ Himself, the Creator of all food) as “good gifts to your children.”

10. Places are recognized as “wild places,” if dominated by many predators.

There shall the great owl make her nest, and lay, and hatch, and gather under her shadow; there shall the vultures also be gathered, everyone with her mate. (Isaiah 34:15, with “nest” [*qânan*] as verb.)

Isaiah’s somber prophecy warns that God will be judging (i.e., punishing) the Edomites, because of the Edomites’ wicked mistreatment of Israelites (see Isaiah 34:6–8); the resultant judgment includes severe desolation of the Edomites’ land—which desolation shall include Edomite lands becoming overtaken by birds of prey (see Isaiah 34:10–16). Because Edomite lands, in the prophesied future, will be dominated by nests of predatory animals—including predatory birds—such lands will become “wild places” (i.e., wildernesses), not fit for human habitation.

11. Flexibility increases opportunities to “fit” and “fill” different situations.

O ye that dwell in Moab, leave the cities, and dwell in the rock, and be like the dove that makes her nest in the sides of the hole’s mouth. (Jeremiah 48:28, with “nest” [*qânan*] as verb.)

Doves, which include pigeons, are famous for resiliently adjusting themselves to the most diverse of habitats.

Decades ago, this writer (with family members) was exploring an underground “lava tube” cave at Craters of the Moon National Monument and Preserve, in Idaho. Inside this most inhospitable venue, perched within a crack in the cavernous ceiling, there was a nest with two pigeons therein! Doves can live successfully almost anywhere—they are peaceful, yet flexible and opportunistic “generalists.”

12. Tree branches are often a hospitable home for nesting birds.

All the fowls of heaven made their nests in his boughs, and under his branches did all the beasts of the field bring forth their young, and under his shadow dwelt all great nations. (Ezekiel 31:6, with “nest” [*qânan*] as verb.)

The tree that thou sawest, which grew, and was strong, whose height reached unto the heaven, and the sight thereof to all the earth, whose leaves were fair, and the fruit thereof much, and in it was meat for all; under which the beasts of the field dwelt, and upon whose branches the fowls of the heaven had their habitation. (Daniel 4:20–21)

Even in Nebuchadnezzar’s dream he recognized that tree branches (a/k/a boughs) are good sites for bird nests!

13. Nests, although sturdy and secure, are only temporal.

Though thou exalt thyself as the eagle, and though thou set thy nest among the stars, thence will I bring thee down, saith the LORD. (Obadiah 1:4)

Eagle nests are sturdy and secure—setting records for their size and weight (as noted above)—yet they too are, after all, only temporal. This provides a good reminder about this passing world. This world will “groan” till the Lord Jesus cancels the curse for sin and death (Romans 8:22–23; 1 Corinthians 15). Till then, we too “groan” (2 Corinthians 5:2–4).

14. Christ prepared for bird homes via nesting habitats and nesting skills.

And Jesus saith unto him, the foxes have holes, and the birds of the air have nests; but the Son of man hath not where to lay his head. (Matthew 8:20, with “nests” [κατασκηνωσεις] as noun.)

And Jesus said unto him, Foxes have holes, and birds of the air have nests; but the Son of man hath not where to lay his head. (Luke 9:58, with “nest” [κατασκηνωσεις] as noun.)

Behold the kindness of our Lord Jesus Christ: He did not insist on having a “home” when He came to Earth to be our Savior. Christ was goal-oriented, undistracted, and not fixated on the things of this passing world.

However, as our kind Creator, He even prepared fitting homes for His multifarious animal creatures, such as foxes and “birds of the air.” Speaking of “home,” it is the very Creator-Redeemer, our Lord Jesus Christ, Who is our true home.

Accordingly, settling (domesticating) specific niches in the earth—even migratory stopover homes—and utilizing home bases for family life activities is needful to fill the multitude of Earth’s multifarious habitats. To achieve this goal, God has providentially equipped creatures with physical bodies (with helpful anatomies and physiologies) and programmed bio-informational instructions (coding and equipping for habitat-interactive behaviors) that are fitted to the dynamic challenges of physical environments (and biotic communities) all over the globe. As earthbound pilgrims, we pass through this mortal life (Hebrews 11:13; 1 Peter 2:11), interfacing with an all-too-often hostile culture (Hebrews 11:36–38). We long for a truly secure home—where we really belong.

But, as Christians, what is our true home? It is not residential real estate housing (Philippians 3:20; Hebrews 11:8–14). Our true homes are not even the earthly bodies that we temporally inhabit, although they are the “tents” we know best (2 Corinthians 5:1–4; 2 Peter 1:13). For Christians, ultimately, our real eternal home is God Himself (Psalm 90:1; 2 Corinthians 5:6; John 14:2–6). As our Creator, He started us. As our Redeemer, we finish with Him. What a homecoming we wait for! (Johnson, 2015, p. 20)

Maybe there are more examples of bird nests being mentioned in Scripture. But, at least, the examples listed above show that bird nests are important, so important (to God) that they merit repeated mention, in the only book that God Himself wrote.

James J. S. Johnson
J.D., Th.D., D.Min.

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Letters to the Editor

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

Rock Ouzel

Dipping, dipping like the Water Ouzel,
That amazing aquatic bird of the Cascades,
But this surprise did me bamboozle,
For gray 'twas not, nor aquatic, nor aids,
Such as Peterson helped, the clues all,
Dead ends gave to this denizen of rocky palisades.

The "rock ouzel" I called it,
This dipper I saw first on Castle Reef high,
Well above timberline, noticed its habit,
Distinctive, of dipping, sizing me up with its eye,
To another boulder and another it would flit,
Then right into dark crevices, no hesitation, it would fly.

It was several years before the rock ouzel I saw again,
It was farther up the Sun River Canyon this time,
High on a ridge this time, too, with dipping mien,
Brown plumage amidst gray limestone, and the chime,
Of its seldom call echoed back whence we three had been,
Collecting trilobite fossils in the shale where we'd begun our
climb.

Nearly a score of rock-ouzel-less years then passed,
Before a rock ouzel most surprised me,
For flat, treeless North Dakota must be nearly last,
Among places to expect a rock ouzel to be,
What fond memories flashed from my past,
When the spritely songster jumped from boulders and did
not flee.

And North Dakota it was, a warm Sunday afternoon,
In the Killdeer Mountains, and they far from flat,
I had climbed a steep slope, gasping a tune,
Out of stout, mixed Bur Oak and Green Ash that,
Formed stately woods, the slopes with verdant shade did
festoon,
Below the rocky slopes on which the rock ouzel sat.



National Park Service photo of rock wren (public domain)

Limestone strata form the cap rock pervious,
And fallen boulders mantle the slopes down to tree line,
On these boulders appeared the rock ouzel curious,
Startled, I halted on the colluvial incline,
She from Dickinson hiked on quite oblivious,
While I stood still and stared at this close-up so fine.

The rock ouzel was very wren-like,
In its mannerisms and body form,
But much larger, maybe between a bluebird and shrike,
Its voice like a dipper but sharper, crisp yet warm,
It jumped into the boulder pile, I resumed the hike,
Delighted this surprise with previous observations to con-
form.

On another trip to North Dakota, I headed east,
 To the Blue Buttes with Brunton and rock pick and vest,
 The buttes surprised me with woods, prairie flowers, bird,
 and beast,
 Far south were the Medicine Hole and Killdeer Mountains'
 limestone crest,
 But here cross-bedded, feldspathic, micaceous sandstone, a
 visual feast,
 Then—there it was, the rock ouzel—was I near its nest?

Boulders again above the level where trees grew,
 And no mistaking it, binocular observation did enhance,
 Quick and agile it was when it hopped and when it flew,
 Colored like a Brown Thrasher, but like a wren it did dance,
 I went back to my sandstone and let the images brew,
 Which I would compare if to see this bird I again had the
 chance.

Just a month thereafter, I was in the northern badlands,
 Amidst landslides, brush, boulders, cliffs, topographic com-
 plexity,
 When all about me swarmed rock ouzels in bands,
 Flocks of adults, juveniles, displeased with my proximity,
 Never before so close, when I canyon walls scaled with feet
 and hands,
 Their wrenishness they confirmed with form, habitat, and
 cliffside dexterity.

They emanated like bees from caves and holes in the
 ground,
 And while their markings were not those of pictures I had
 seen,
 This bird was truly the robust Rock Wren, for I had also
 found,
 That all other characteristics matched, and plumage varies
 between,
 Different regions oftentimes, and there are reasons several
 and sound,
 To believe at last this mystery bird has from it rocky, shady
 past come clean.

P. Klevberg
 MMXIV

(Editor: The above poem refers to the rock wren (Salpinctes obsoletus) described in James J. S. Johnson's "Rock Wrens: Living Life on the Rock," Creation Research Society Quarterly 59 (1):57 (Summer 2022).

Some Thoughts on Time

Dr. Corrado's (2023) article on time dilation was interesting. I would like to add some personal thoughts on this subject. First, Corrado mentions in his abstract that time is a dimension and was created. My view of Genesis chapter one is that space was created (Gen. 1:1), matter was created (also Gen. 1:1), and energy was created (Gen. 1:3). I see no mention of the creation of time. Time is basically change. If the whole universe

consisted of a single, unchanging sphere, there would be no way to determine how much time would be transpiring. So when God created space, matter, and energy on day one and the energy started to change matter in space, we could call this "time." So time is not a dimension that we can move through, such as length, width, and height in space. It is a relationship between matter in space, acted upon by energy. The ba-

sic relationship of velocity = distance ÷ time can be rearranged to become time = distance ÷ velocity. Distance depends on the amount of space between objects of matter and velocity depends on the amount of energy acting on the matter. So time is a relationship between energy and matter in space. Time is not something we can traverse like space. We cannot go into the past because it does not exist since it became the pres-

ent. Neither can we go into the future because it does not yet exist. We are stuck in the present. Time travel is an impossibility.

I do not believe that time is like an unwinding movie reel in which the future keeps becoming the present. Rather, the present keeps turning into the future. The future and the past do not exist. The future will exist and the past did exist, but they do not exist in the present. I do not believe that God is outside of time seeing past, present, and future all at the same time (like looking at a completely unwound movie reel). Even God cannot see and interact with that which does not exist. But God is omniscient and therefore has intimate, perfect knowledge of the present. He knows the position and condition of every particle of matter. And since He knows how they are interacting with energy in space, He knows what will happen to every particle after each interaction. In other words, He has perfect knowledge of everything that will happen in the future. It is not that He is seeing something that does not exist; He knows what will exist. If I grasp an apple with my palm down, I know what will happen if I release it. I am not seeing into the future. I know what will happen because of my familiarity with God's creation. Likewise, God continually integrates all His knowledge of every detail of the present to know every detail of what will happen in every moment of the future. We humans equate seeing with knowing. However, to God, "... the darkness and the light are both alike

to thee." (Psalm 139:12). God does not need electromagnetic radiation to reflect off matter in order to detect it, such as we experience when seeing. God's "seeing" is really "knowing." So God does not really see the nonexistent future, He knows it. When we speak of God seeing, we are speaking anthropomorphically. God is Spirit (John 4:24) and does not have physical eyes that can detect certain frequencies of electromagnetic radiation. It is as if He can see things that to us do not yet exist. But they do not yet exist to Him either. He simply knows what will happen in every microsecond with every sub-atomic particle before it happens.

I do not believe that God's miracles are based on His dilation of time. God's miracles are instances in the present in which He supersedes natural law (His regular way of sustaining the universe). The miracles Dr. Corrado noted in John chapter 6 are God's intervention with the three aspects of His creation noted above. Jesus Christ's multiplying bread and fish (v. 5-14) showed His supremacy over matter. His walking on water (v.19) showed His supremacy over energy (the force of gravity). His causing the boat to suddenly appear at the shore (v.21) showed His supremacy over space. There is no indication that Jesus travelled into the past or future. Jesus was subject to time. It was His body that supernaturally superseded gravity, enabling Him to walk on water.

To conclude, God is indeed eternal. "Before the mountains were brought forth, or ever thou hadst formed the

earth and the world, even from everlasting to everlasting, thou art God." (Ps. 90:2). "I am Alpha and Omega, the beginning and the ending, saith the Lord, which is, and which was, and which is to come, the Almighty." (Rev. 1:8). "For of him, and through him, and to him, are all things: to whom be glory for ever. Amen." (Romans 11:36). In addition, how many eons did it take God before creation to completely plan out the entire creation with all its myriad details? He had all eternity, but being omniscient, He did not have to spend any time at all planning before creation. There was no time before creation. Therefore, He eternally foreknew everything about His creation before "the beginning." Paul attests to this in Ephesians 3:11, where he tells us about "... the eternal purpose which he purposed in Christ Jesus our Lord..." Can we comprehend eternity? No. Can we comprehend the interface between eternity and creation? No. All we can do is to worship Him and to surrender our lives to Him. Let us also take heed to the wisdom of David, who stated that he did not exercise himself in great matters, or in things too high for him (Ps. 131:1).

Arthur Manning

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Corrado, J.K. 2023. The miracle of Jesus walking on water through the lens of gravitational time dilation. *Creation Research Society Quarterly* 60(1):4-10.

Reply to Arthur Manning's Comments

Thank you for your interest and your thoughts on my paper. As you cover many topics, I'll merely respond to your first point. I do not consider the belief that God created time is illogical. According to physics, time is a property that results from the existence of matter. Therefore, time exists when matter does. The bottom line is that time began with God's creation of the universe. Prior to that, God simply existed. Due to the absence of matter and the immutability of God, time had no existence, significance, or relationship with God. "God is spirit" (John 4:24); therefore, God is timeless, as opposed to being eternally in time or outside of time. God merely created time as a limited component of His creation to facilitate the execution of His purpose in His disposable universe (see 2 Peter 3:10–12).

"For by Him were created all things that are in heaven and on earth, visible and invisible" (Colossians 1:16). Although time is not visible, its effects are. Time is intrinsically linked to the changing states of both visible and invisible entities. Thus, matter, space, and time exist either simultaneously or not at all. According to Thomas (2018), "Genesis 1:1 says, 'In the beginning God created the heavens and the earth.'" Clearly, no created entities existed before that moment. And without material or immaterial entities, how could anyone notice the passage of time? So, it looks like "the beginning" marked the first moment of time. One could make a similar argu-

ment about space. Without space for material like clocks to inhabit, then no clocks could exist to mark the passage of time. And God did not create space ("the heavens") until Genesis 1:1. Another argument suggests the same conclusion. One of God's first acts of creation was to invent a giant device to mark time—a spinning earth near a light source that delineated evening and morning. Hebrews 11:3 says, "The things which are seen were not made of things which are visible." Scripture doesn't record any things or events prior to the beginning, and time is defined by changes in the state of things" (Thomas, 2018).

Lastly, there are verses that may explicitly say that God created time (see Hebrews 1:2; 11:3), which literally state that "the ages" were created through Christ. Nonetheless, some commentators assert that these usages may be an oblique way of saying that Christ created everything. However, the author's use of the same word to refer to periods of time in Hebrews 6:5 and 9:26 suggests that while Hebrews 1:2 and 11:3 refer to the creation of all things, they emphasize the temporal nature of all things.

As for the remaining points made above, due to the complexity of time and the limitations of our finite minds, we can only partially comprehend time and God's timeless existence. And in doing so, we characterize Him as a God without beginning or end, everlasting, infinite, eternal, etc. Psalm 90:2 states, "from everlasting to everlasting,

You are God" (also see Psalm 93:2). He has always existed and always will. Clearly, there are a spectrum of beliefs and perspectives on God's relationship to time (as you have articulated yours above). The connection I made of Jesus to gravitational time dilation is merely a perspective; a different way of looking at a complex matter in an effort to further appreciate the creation and the awesomeness of God.

Again, I appreciate your thoughts and beliefs on the matter. This dialogue is enriching as we collectively work to understand creation, visible and invisible, as "it is the glory of God to conceal a thing: but the honour of kings is to search out a matter" (Proverbs 25:2). I look forward to the day that we can hear from the Creator how time actually works!

Jonathan Corrado

Reference:

Thomas, B. 2018. Time and Creation. *Acts & Facts*. 47(5). <https://www.icr.org/article/time-and-creation/>

Tomkins (CRSQ 59:207–216 [2023]) Ignores Problems with CPT and Megasequences

Tomkins (2023) recently presented an exegetical and geological interpretation of Genesis Chapter 8:1–12. While we agree with his outline of biblical history, we reject its application through catastrophic plate tectonics (CPT) and Sloss-derived stratigraphic megasequences. How can these uniformitarian-derived concepts be unified with the Bible?

Problems with Catastrophic Plate Tectonics

The popular young-earth creationist tectonic model known as CPT contains many serious flaws (Reed et al., 1996; Reed, 2000) and requires several “miracles” to justify its adoption into a biblical framework of earth history (Froede and Akridge, 2016). Space does not allow a review of its many problems and the reader is encouraged to review the references provided here. Tomkins (2023) offers no answers to the many long-standing questions, some specific to the problems CPT creates apart from plate tectonic theory (Froede, 1998; Froede, 2002; Reed and Froede, 2002; Akridge et al., 2007). Other tectonic interpretations are possible that are consistent with a biblical understanding. However, much of that work remains to be conducted. We remain perplexed why CPT is viewed as essential in biblical geologic history and ask what part of Genesis 8 demands CPT?

Fossilized Animal Footprints in Megasequences

Tomkins (2023) uses the uniformitarian standard geologic timescale (SGT) with an overlay of Sloss stratigraphic sequences (re-labeled megasequences) to define his proposed Flood framework (Figure 1). We have challenged the utility of Sloss-derived megasequences in defining an acceptable form of Flood history (Froede, et al., 2015) but no response from advocates of SGT/megasequences has been presented. It should be noted

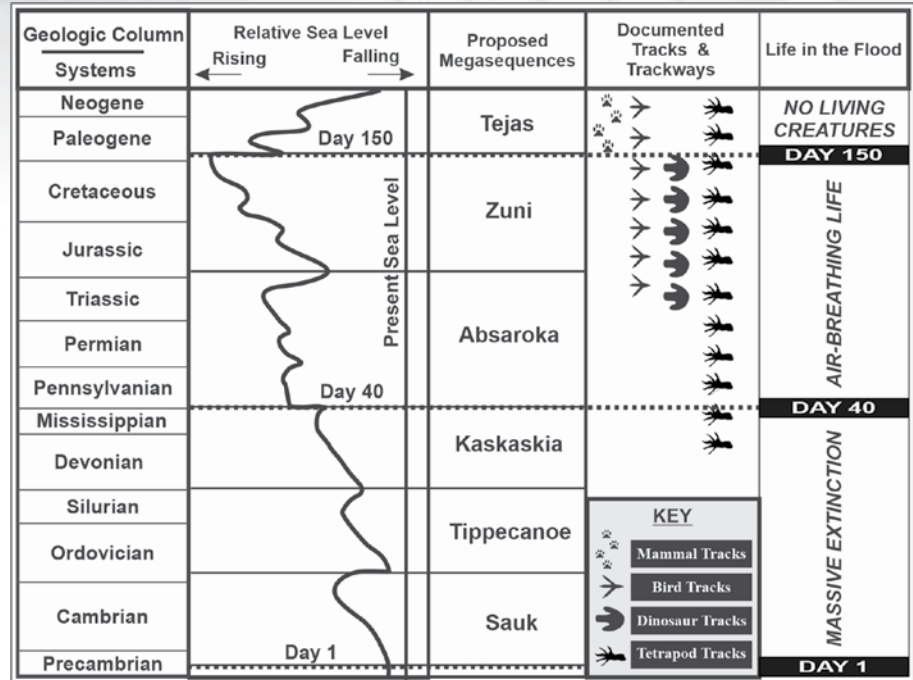


Figure 1. We combine the Tomkins (2023) defined Sloss-derived megasequences (based on changes in global sea-level position) with the fossil record of animal tracks/trackways and the corresponding biblical expectations. Animal tracks/trackways occur throughout the Paleogene/Neogene where none should occur. How does this contradiction defend the Bible? We continue to contend the SGT/megasequence framework proposed by Tomkins is impossible to unify with biblical history.

that two similar, but unique Bible-based geological timescales (Walker, 1994; Froede, 1995) have been proposed to replace the SGT.

The most important issue still facing young-earth creationists who continue to use the SGT/megasequence framework is to provide an explanation for the fossilized track/trackway impressions left in the rock record by formerly living life-forms (Froede, 2012; Froede et al., 2014; Froede et al., 2022). Tomkins (2023, p. 210) states:

This beginning of Floodwater recession or abatement corresponds to the initiation of the Tejas Megasequence

sedimentation in the lowermost Paleogene System—the final megasequence of the Flood.

Note that Day 150 of the global Flood is the contact between the Zuni and overlying Tejas megasequences marking the time all terrestrial life on Earth had perished (Gen 7:22–24). Therefore, any fossilized track/trackway of a living animal or bird that formed traces in the Paleogene/Neogene (Tejas megasequence) contradicts Scripture. Do such fossilized tracks/trackways exist?

Uniformitarian geoscientists have documented numerous tracks/trackways from a variety of formerly living ani-

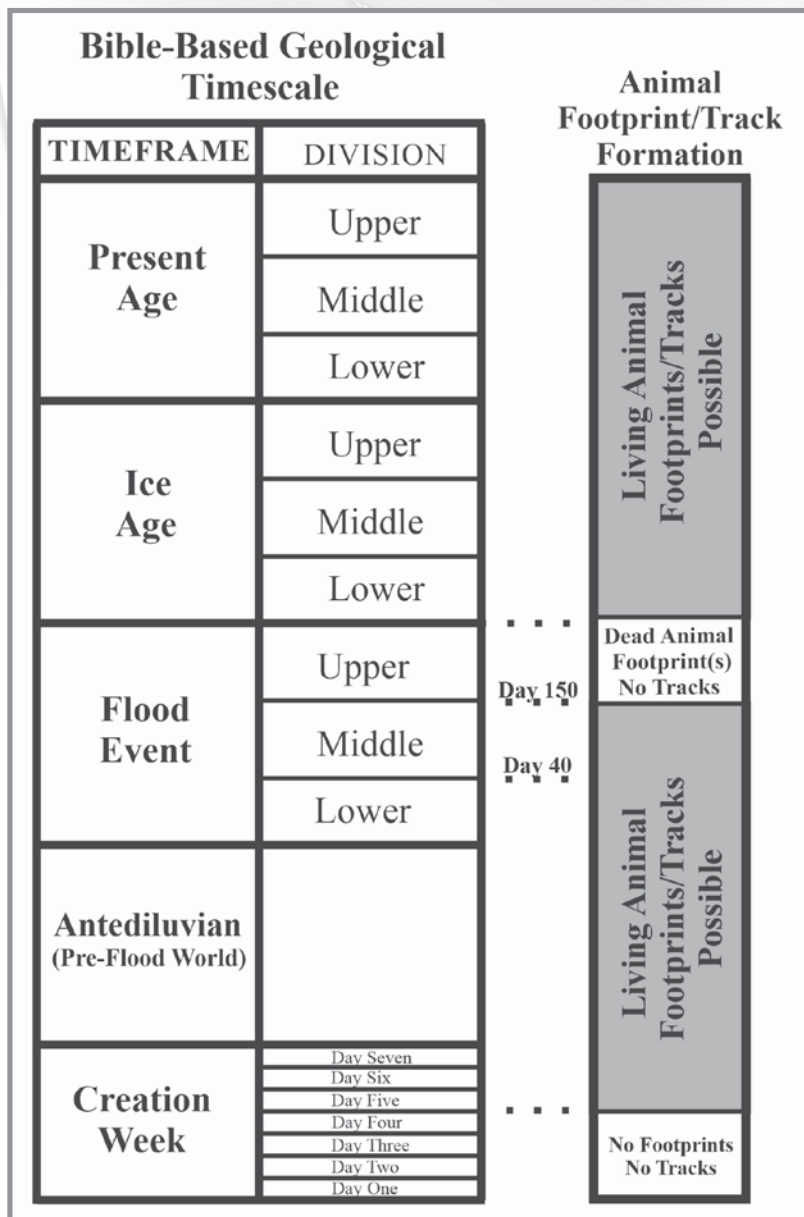


Figure 2. A Bible-based geologic timescale showing the Timeframes/Divisions when animal/bird tracks/tracks could have been created and later fossilized consistent with a biblical narrative. It does not use CPT or SGT/megasequences to define geologic time and avoids the many conflicts created in following the uniformitarian worldview.

imals and birds throughout the Paleogene and Neogene (Tejas megasequence) [e.g., Sarjeant and Reynolds, 2001; Mustoe, 2002; Hasiotis et al., 2007; Lucas et al., 2007; Lüthje et al., 2010;

Santucci et al., 2014; Xing et al., 2014; Díaz-Martinez et al., 2015; Abbassi and Dashtban, 2021; Lockley et al., 2021] (Figure 1). The trace fossil evidence

negates the entire SGT/megasequence framework proposed by Tomkins (2023).

An alternative interpretation is possible for the animal and bird tracks/trackways formed throughout Earth history that remains consistent with a biblical geologic timescale (Figure 2). The many conflicts created by following CPT and the SGT/megasequences are thus removed when using this interpretation. This geologic timescale removes the many conflicts created in following CPT and SGT/megasequences. Each track/trackway site should be examined within a biblical context to determine the proper geologic Timeframe/Division in which it exists. Much of that work remains to be conducted by young-earth creationists.

Conclusions

Tomkins (2023) presents a CPT/megasequence-based Flood narrative ignoring the many previously identified problems, not only tectonically, but with animal/bird fossilized footprints occurring throughout the purported geologic history of CPT. Specific to Tomkins' exegesis of Genesis 8:1–12, fossilized animal and bird tracks/trackways exist in sedimentary strata throughout the Paleogene and Neogene—when he claims Floodwater was receding from Earth. Tomkins' article presents another example of the growing schism developing in young-earth creation geology in defining a Bible-supported Flood framework (Froede and Akridge, 2013). While we applaud his biblical defense of Scripture, we request Tomkins address the problems we identify in his CPT and Sloss-derived megasequence framework.

Carl R. Froede Jr.
Snellville, Georgia, USA

A. Jerry Akridge
Arab, Alabama, USA

John K. Reed
Lookout Mountain, Georgia, USA

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Reply to the Froede et al. Letter to Tomkins

I appreciate the time and effort that Froede, Akridge and Reed took in composing a response to a recent article on Genesis 8:1–12 by Tomkins (2023). Since the criticism was mostly addressed at my work, and my acceptance of Catastrophic Plate Tectonics (CPT), I took it upon myself to respond.

First of all, they mention ‘problems’ with CPT. And yes, there are some unanswered issues, but there is a plethora of empirical data in support of CPT that they seem to dismiss. Some of these data were published in an article I wrote several years ago (Clarey, 2016). To my knowledge, none of what was presented as evidence in support of CPT was ever addressed by Froede, Akridge or Reed. And of course, Genesis does not ‘demand’ CPT by any means. But it is currently the best Flood mechanism to explain the most observable geological and geophysical data (Clarey and Werner 2023).

Secondly, we have responded to Froede et al. (2015) and have shown that the standard geologic column (not timescale) can be used in conjunction with the Sloss-derived megasequences in defining a Flood history (Figure 1) (Clarey, 2016; Clarey and Werner, 2018, 2023; Johnson and Clarey, 2021). We have published several articles on the global nature of the megasequences and their correlation across multiple continents (Clarey and Werner, 2018, 2023). It is false to say that correlation of similar rock beds requires a belief in uniformitarian dogma. For example, extensive salt, gypsum and chert-rich layers (rocks not influenced by fossil correlation) track perfectly within the boundaries of many megasequences, supporting the validity of the megasequences (Clarey and Werner, 2018). These types rock beds are easily identified without reference to fossils or evolutionary dogma.

And no one has a perfect understanding of fossil footprints, nor their origins,

especially in the post-Zuni layers (Tertiary). And yes, there shouldn’t be any live land animals to make footprints after Day 150 of the Flood year (post-Zuni) until the post-Flood.

That said, Figure 1 in the preceding Froede et al. letter shows fossil footprints extending upwards from the Zuni

megasequence all the way to the top of the Tertiary (Paleogene and Neogene), with only the dinosaur prints stopping at the top of the Cretaceous. Furthermore, the diagram seems to suggest there are the same number of fossil footprints throughout the entire Tertiary (Tejas). However, this is not really the full story.

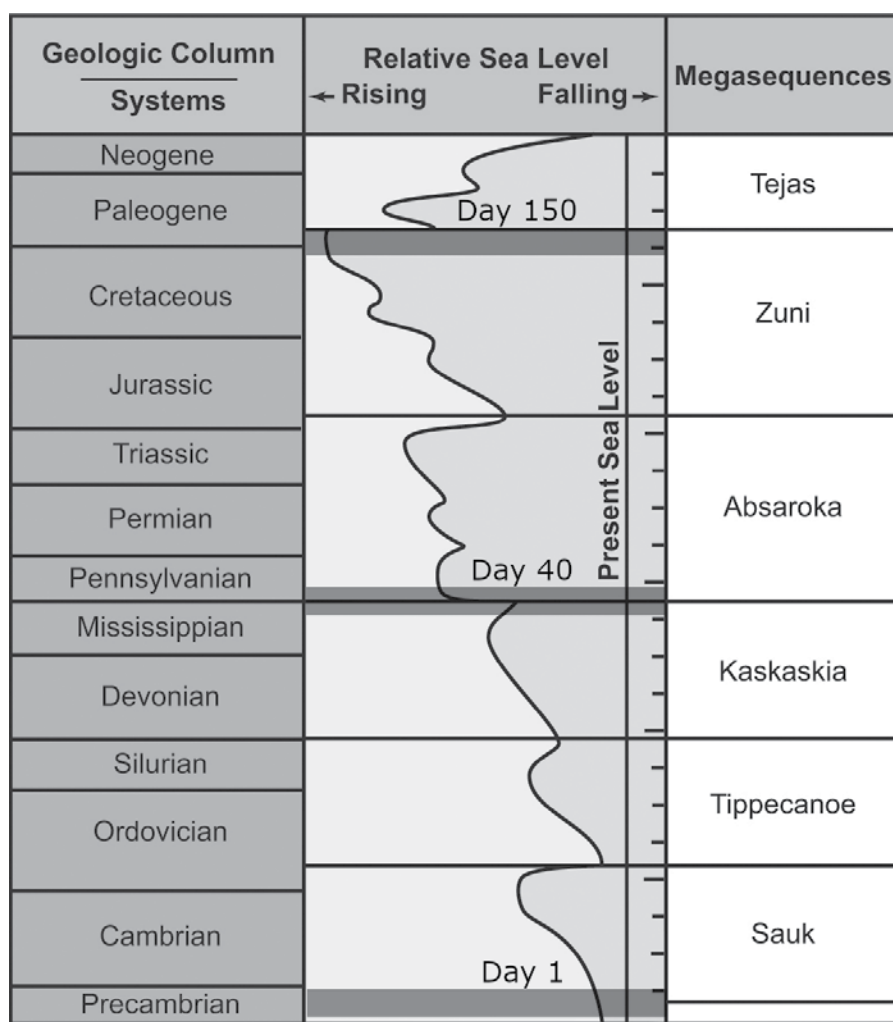


Figure 1. A revised version of figure 2 from Johnson and Clarey (2021). Diagrammatic global sea level curve showing the megasequences and geologic systems with Days 1, 40, and 150 superimposed. Day 1 is the initiation of the Flood in the pre-Sauk (Late Precambrian). Day 40 is near the boundary of the Kaskaskia-Absaroka when the Ark became free-floating. Day 150 is interpreted as the sea level peak near the end of the Cretaceous System and near the end of the Zuni Megasequence.

According to Brand and Florence (1982), who did a fairly comprehensive study of animal tracks throughout the rock record, the majority of Tertiary (or Tejas) footprints do not appear until late in the Tertiary. They also show that it is not just the dinosaur footprints that disappear at the end of the Cretaceous, but all trackways from reptiles and animals designated as ‘other reptiles’ and even a group called ‘indeterminate animals’ also disappear at the same level (end Zuni). This implies there must be something significant about the end of the Cretaceous (near the end of the Zuni) in terms of the Flood year. In addition, they found that tracks for amphibians disappear in the rock record at in the Permian, about midway through the Absaroka megasequence.

We interpret the many types of land animal tracks that disappear at the end of the Cretaceous or earlier levels as evidence of a progressive Flood that peaked at the end of the Zuni megasequence (Day 150). As each ecological zone was inundated by progressively rising water, those animals and plants living at each zone was systematically entombed in the rocks, including any footprints.

In addition, much of the global geology indicates the high-water point (Day 150) was achieved at the end of the Zuni megasequence. For example, the Zuni covers the most surface area of any of the six megasequences. We initially found this to be true across three continents and our latest research has found this to be true across five continents (except Australia and Antarctica which are in progress) (Clarey and Werner, 2023). Also, the Zuni has the highest sedimentary volume of any of the six megasequences across these five continents (Clarey and Werner, 2023). It is slightly greater than the Tejas, which we interpret as the receding phase (post Day 150). It should be no surprise that the post-Day 150 (post-Zuni) sediments have tremendous volume as this was the material that was scraped off the rising

mountains and the exposed land surface as the Flood water drained.

And there is a large amount of geological data suggesting sudden changes in water direction occurred at the end of the Zuni too, including deposition of the 300–600 m thick Whopper Sand in the deep Gulf of Mexico (Clarey, 2015; 2021 and Sweet and Blum, 2011) This sand body extends across much of the Gulf and was deposited at very onset of the Tejas megasequence (Clarey, 2015). It most likely formed from massive sheet-like drainage off the North American continent as the water began to recede. Again, indicating the Tejas is mostly receding phase.

Finally, there are tremendously extensive deposits of coal offshore Asia and Australia buried within Tejas sediments, indicating massive amounts of plant material was washed off the land into the ocean as the water was receding (Clarey, 2020). All of this geological evidence indicates the Flood peaked at about the end of the Cretaceous (end Zuni), with the receding phase represented by the Tertiary (Tejas).

I admit the tracks in the Tejas megasequence layers are not yet fully resolved. But we cannot throw out the global stratigraphic record in the process. It's the whole “baby and the bathtub” analogy. There is just too much stratigraphic and fossil data that indicate the Tejas is post Day 150 but still part of the Flood year (Clarey and Werner, 2023).

Furthermore, it is possible that many of these tracks were made by animals as they walked across freshly exposed post-Flood terrains. The immediate, post-Flood undulating land surface was created by differential erosion of the sediments during the Flood recession (including some Tejas deposits). This process exposed different levels of Flood rocks, and different levels of the Tertiary. During the earliest years after the Flood, these layers would have most likely remained un lithified. Animals walking on the exposed land surface could still

leave tracks and some may have even burrowed into whatever strata was exposed. In this way, many different Tejas (Tertiary) horizons could have served as a substrate for tracks, whether it was later designated as Miocene, Pliocene or some other Tejas subdivision. Therefore, it is possible that many of the tracks and burrows found in Tejas sediments were actually made by post-Flood animals.

And maybe Mike Oard is correct and conventional paleontologists have sometimes misinterpreted the upper parts of the Tertiary (Tejas). Maybe some Upper Tertiary layers should be identified as Pleistocene instead. Each site needs further study.

Megasequences (and CPT) should not be lumped in with uniformitarian dogma. They represent real, mappable rock units that can be properly correlated from continent to continent across the globe. And they can be used to defend the Biblical account of a global Flood as recorded in Genesis because they show the same general patterns on every continent. This supports the global nature of the Flood. But, yes, many details still need to be worked out. Nothing in a historical science like geology is perfectly clear.

Timothy Clarey
Dallas, Texas, USA

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A Response to “Main Goals of the Creation Movement”

I was mildly surprised by Jerry Bergman’s (2023) letter to the editor titled: **Main Goals of the Creation Movement**. Perhaps I should not have been, given previous exchanges with him in publications of the Creation Research Society (CRS). For a brief summary, see the letter to the editor by CRS board president, Bob Hill (2021). These exchanges make it obvious that CRS is being challenged, even if CRS is not named in this letter (Bergman, 2023).

I have known Jerry for many years, first as a reader of his articles, then as an editor, and more recently I served beside him on the CRS Board of Directors. He is warm, personable, full of enthusiasm, and has an amazing memory for numerous factual details. He loves learning about science and has the heart of an apologist. All wonderful traits. I love and appreciate him as a brother in Christ.

In his short letter (Bergman, 2023), Jerry does a wonderful job of revealing his heart’s passion. Wouldn’t we all agree that removing philosophical obstacles to accepting Christ is important?! That is most certainly one of my motivating reasons for being involved in creation

science. However, as has been pointed out before, what removes obstacles for one person might not be what removes them for another (Boyd, 2021). CRS is a “professional organization of trained scientists and interested laypersons” (<https://www.creationresearch.org/general-information>) with a focus on scientific research. This identity influences our unique focus within the broader Creation Movement and the types of obstacles we specifically address.

After sharing his passion, Jerry then presented six points he feels are most appropriate to meet this goal of removing obstacles to accepting Christ. I would like to discuss his points as they relate to the work of CRS.

Regarding his first bulleted point about the implausibility of molecules-to-man evolution, Jerry cited six of his books where he has already addressed this topic. I can point to *Creation Matters* articles I have written between 2009 and 2022 where I also have covered the topics of natural selection, the nature of mutations, homology, convergent evolution, and poor-design arguments. It looks like this strategy is being well-

employed both at CRS and elsewhere! The one thing I have refused to do is take a lay-level apologetic treatment of these topics and put it in our technical journal. The *Creation Research Society Quarterly* (CRSQ) is for original research that impinges on creation as an alternate view of origins (see <https://www.creationresearch.org/history-and-aims>). Therefore, it was never intended to be a venue for just attacking Darwinism.

Regarding the second bullet point, the CRSQ has numerous research articles that address human origins. See for example Tomkins, 2014, 2016; Carter and Lightner, 2016; and Lightner and Cserhati, 2019. These high-quality articles are consistent with the goals of the *Quarterly* which “emphasizes original research and the reinterpretation of existing scientific data within the creationist framework.” When I was a biology section editor for the CRSQ, it was these types of articles I encouraged, rather than articles that repeated information familiar to anyone who reads material from the Creation Movement’s fine apologetics organizations and/or that primarily attacked evolution.

Regarding the third bullet point, why should a scientific society be a venue for the discussion of the harm Darwinism has done to society? Is that an important topic? Of course! Much has already been written on the topic. Should the pages of our scientific journal continue to be a venue for such articles, which seem largely repetitious? It seems to me that would contradict our mission of supporting creation research. Further, doing so can create more obstacles by handing evolutionists fodder for their accusations that we do not do *scientific* research. There are other venues where articles on the harm of Darwinism are far more appropriately placed.

Regarding the fourth bullet point, there are lots of ID articles that already deal with irreducible complexity. These ideas have also shown up in *Creation Matters* and the *CRSQ* (e.g. Guliuzza and Sherwin, 2016; Truman, 2016a, 2016b) as they relate to new topics that have not been explored in depth elsewhere. To emphasize again, we are not looking for a rehash of articles that can be found elsewhere on creation apologetics websites or in the resources they and CRS sell.

As to bullet point five, see our statement of belief at <https://www.creationresearch.org/history-and-aims>. Our Society exists to do research that impinges on special creation and the Flood. We deal with the topic so much that we sometimes get complaints about too many geology articles. So, we are clearly addressing this point.

Bullet point six is about supporting those who have been marginalized for their creation beliefs. Jerry has some books telling their stories. Our Society provides a place for them to belong and share with other creationists. So, there is a place for them in CRS if they agree with our statement of belief. They can find support on CRSnet and our journal provides a place where they can publish high-quality research consistent with our aims.

I appreciate Jerry. After reading his letter I believe his points are motivated by misguided frustrations. Not all the articles he has submitted get published. We have guidelines for what we publish, and some of the criteria I have used are described above. We also use peer reviewers. It is fine to write on topics outside one's field, but as an editor, I used peer reviewers within the field of the topic discussed. The majority of articles I rejected while I acted as a *CRSQ* biology section editor were articles where a very well-meaning author didn't understand the topic they wrote about. Publishing poor-quality articles that do not accurately portray a topic harms our reputation and gives evolutionists legitimate reasons to mock us. Poor-quality papers will strengthen the obstacles that block people from believing, rather than removing them, as we desire. We cannot compromise; we must maintain high-quality peer review.

So, I appeal to you my dear brother, Jerry. Remember that when your articles have met with our aims and expectations, they have been published. When they have not, I and others have spent hours of our time trying to help you understand the target you should be aiming for when articles are submitted to the *CRSQ* or *Creation Matters*. I do not feel you have listened, but you keep pushing for us to do what seems best to you despite the clear goals of our organization. We are not just another apologetics ministry focused primarily on reaching laymen. Can you please respect CRS for who we are?

I encourage you, dear Jerry, to rejoice in the extent to which you have been able to contribute and be more gracious toward CRS so we can be what God has called us to be. Let us move forward together for the glory of God, encouraging high-quality creation research!

Jean K. Lightner

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Media Reviews



Archaeology from Space: How the Future Shapes our Past

by Sarah Parcak

Henry Holt and Company, New York, 2019, 277 pages. \$30.00

In 2010, when I was writing a paper entitled, *Where in the world is the Tower of Babel?* (Habermehl, 2011), I became aware of the archaeologist, Sarah Parcak, who had just published her first book on satellite remote sensing the year before (Parcak, 2009). I included a section on the merits of remote sensing in that paper, suggesting that it had potential for looking for the remains of the Tower of Babel in the Upper Khabor Triangle in the Al-Hasakah Governorate of Syria. I had concluded the ruins were most likely residing a short distance below the ground surface, depending on how much of the Tower was built before God stopped the project, and what effects flooding and sedimentation would have had in that area in the many years since.

Meanwhile, Parcak has continued energetically with her work in remote sensing archaeology and has now published this second informative book on the subject, *Archaeology from Space: How the Future Shapes our Past*. As

archaeologists will tell you, finding sites the traditional way by searching on the ground can be slow and frustrating. Satellite remote sensing is a tool in the archaeologists' kit for photographing the surface of the earth to find large numbers of potential new sites, many of which are visible only from the air. However, as she points out, it is still necessary for archaeologists to actually go to the site and dig to verify what is there.

The book is written from a secular point of view. Because Parcak is an Egyptologist, she includes an overview of Egyptian history. The assumption that these scholars make is that any collapse of Egypt had to be tied to drought caused by the Nile's not rising as usual; God-sent calamities like the ten plagues do not find a place in the secular way of thinking.

The author writes in a combined popular and technical style that is somewhat unusual, with twists of humor interspersed. Her personal history and life as an archaeologist intertwines with information on remote sensing and its uses. Parcak includes a section on a fictional ancient Egyptian, as well as interesting anecdotes. She once met the

actor Harrison Ford, whom she credits with inspiring her and many others to be archaeologists in his movie, *Raiders of the Lost Ark*.

The subject of remote sensing is not simple, as there are various kinds of technology available. When deciding which satellite to use, a researcher must determine what resolution is needed and how much (s)he can afford to pay, as well as other considerations. Satellites with names like CORONA, LANYAR, ARGON, IKONOS, SPOT, TIROS and NASA's ERTS-1 (Landsat) are examples. Although remote sensing photos can be expensive to acquire, some are not. NASA lets the public use all of its photos at no charge. Also, US Cold War spy photos have now been declassified and are available free of charge. Interestingly, the old photos are sometimes more useful than recent ones because they were taken before modern developments covered over the territory.

The more recent LIDAR (Light Detection and Ranging) surveying system is unlike regular photos, in that it can seemingly strip vegetation away and 'see' what is beneath. This is most convenient when looking for something like Mayan

ziggurats hidden in the jungles of Belize. Google Earth, in comparison, would show only a photo of a green tree canopy from above.

Parcak tells the reader about the TED (Technology, Entertainment and Design) million-dollar prize that she won in 2016 for her vision of global remote sensing as applied to archaeology. With this money, she has developed an online platform called GlobalXplorer where large numbers of people can use their own computers to examine satellite photos of small areas of the earth for possible indications of archaeological sites. Data from all these people are then put together to make a comprehensive picture of a given area. The beauty of this crowdsourcing project is that large areas of the earth can be covered in a relatively short time. For instance, the entire country of Peru was examined in this way in the first round of her project. Parcak's plan is to speed up this system

of research so that her next project of examining India will go faster. For anyone interested in joining her venture, a "Note to Readers" page at the beginning of the book cordially invites the reader to become "a space archaeologist in training."

It does not take much imagination to realize that a program similar to GlobalXplorer could be used for searching for biblical sites like Noah's Ark or the Tower of Babel. Creationists could set up their own online platform for examining areas of the earth where they have a special interest. There is a great deal of highly technical expertise in the creationist community that could be harnessed. People who examine the satellite photos on their computers could include all ages. This would be an especially attractive project for our young people.

In addition, it is possible that LIDAR would be useful in looking for Noah's

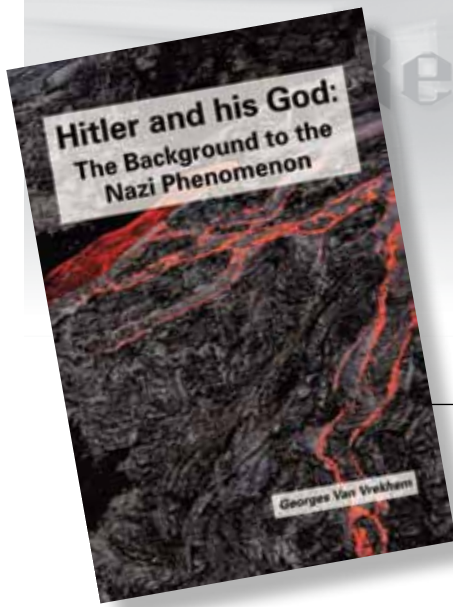
Ark, if it is in an overgrown area, such as Mount Cudi, for example. Whether or not there are any remains of the Ark that might show up is hard to say.

There are undoubtedly other areas of biblical archaeological research that could benefit from remote sensing. The message of this book is that much of the future of archaeology lies with remote sensing, whether satellite or LIDAR. Some of that future may be ours if we creationists appropriate it for ourselves.

Anne Habermehl

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Reviews

Hitler and his God: The Background to the Nazi Phenomenon

by Georges Van Vrekhem

CreateSpace Independent
Publishing Platform, Scotts
Valley, CA, 2022, 590 pages,
\$13.22

I have both read many books, and published several, on Adolph Hitler. In my judgment, Van Vrekhem's 588-page book is one of the most carefully researched books ever published on this topic. He has carefully documented the central role Darwinism played in causing the Holocaust, and goes into great detail about who and what influenced Hitler's anti-Semitism and genocidal goals. It was around 1880 when the events that produced Hitler coalesced. One important factor was that the ideas of Darwin were accepted even by many religious persons. (p. 30). Furthermore, "already in 1889... Darwinism was becoming the supreme authority of the militarists in all European countries" (p. 177).

Social Darwinism gave scientific support to the idea that some people groups were superior to other people groups. Specifically, Hitler and the Nazis believed that the German people were "the highest form of life ever to evolve in the universe" (p. 27). The eastern theater of WWII was motivated

primarily by the need for "living space for the master race," namely the Aryan race (p. 136). And the "Aryans were the foremost race on earth....the white man's pride" (pp.152, 174). Thus, this justified conquering Russia from inferior peoples for the Herrenmensch, or the "superior men." Further justification for this was the fact that the "Darwinists' actions, be they theories, treaties or conquests, did not really matter" (p. 346).

Hitler, as far as historical records indicate, never read Darwin's *Origin of Species*, even the German translation. Rather, he was influenced by those who did read and accept Darwinism, such as Jörg Lanz, a leading supporter of Darwinism whose work Hitler did read during his days in Vienna (p. 29). The first language into which the *Origin of Species* was translated was German. The translation went to press in 1860, only one year after Darwin's *Origin of Species* was first published. The translator was naturalist and paleontologist Heinrich Georg Bronn.

Van Vrekhem has concluded that the usual reasons given for hating the Jews, (a mere one percent of the German population), were insufficient to produce anti-Semitism. However, when Darwin came along, the required

ideology then existed. Van Vrekhem writes that "Darwinism, as interpreted by Chamberlin and Rosenberg, was much more straightforward and handier" than previous anti-Semitism claims (p. 92). The Nazis believed that the Nordic-Aryan race was the superior race due to the purity of their superior blood. This meant that to maintain superiority it was required that the blood of the superior race not mix with that of inferior races. Some German Jews were inferior simply because they had some Jewish blood. To Hitler, the elimination of the inferior races was more important than winning the war. Towards the end of the war this priority was made very clear when military resources were used to move the Jews to the concentration camps instead of moving troops, supplies and other materials, including food and fuel, to the front.

Soon "Racism and Darwinism... entered into a symbiosis in Hitler's *Mein Kampf*" which was the book Hitler and the Nazis used to implement their genocidal goals (pp. 118–119). Chamberlin, who had a major influence on Hitler, wrote that to improve humanity "we must...breed for superior human types, as dictated by Darwinism" (p. 262). The Jews were not only an inferior race but

their intellectual powers were “not the result of an inner evolution but rather have been shaped by the object lessons which the Jew has received from others” (p. 276). In other words, the Jew did not evolve his intelligence as did the Aryan, but rather copied it from the more evolved Aryans. In summary, the corner stone of “National Socialism may be summarized as...the idea of the racial superiority of the Aryan-Nordic-Germanic people” (p. 244)

Van Vrekhem’s work has carefully documented the major influence of

evolution-based racism on Hitler, a conclusion recognized by many leading WWII scholars. For example, Stephen Ambrose wrote “Racism was at the heart of the Nazi philosophy” (Ambrose, 2014, p. 151). Along with accepting Darwinism, the creation account that all humans are descended from Adam, and thus there is only one race, the human race, was rejected. If they had retained the Biblical worldview, it is unlikely that WWII would have occurred, since the Biblical worldview negates the entire

reason underlying Hitler’s and the Nazi’s worldview. This book is a must read for those interested in the enormous harm done by Darwinism, the results of rejecting the creation worldview, and the history of modern anti-Semitism.

Jerry R. Bergman

Reference

Ambrose, S.E. 2014. *D-Day Illustrated Edition*. Simon & Schuster, New York, NY.

Book Reviews Needed!

Please share with the CRS community your opinion of creation- or science-related books you’ve read!

See information on p. 232 about writing a review. To submit a review, please contact Mary Beth De Repentigny, Book Review Editor, at marybethd4@gmail.com



Errata

In *CRSQ* 60(1) Summer 2023 on page 23, in “Lithification of Clastic Sediments: Part 1: Significance, Processes, and Modeling” by Peter Klevberg and Michael J. Oard, reference is made to Barrick (2018) and Barrick et al. (2020), but the references were not included. The missing references are:

Barrick, W.D. 2018. Exegetical analysis of Psalm 104:8 and its possible implications for interpreting the geologic record.

In Whitmore, J.H. (editor), *Proceedings of the Eight International Conference on Creationism*, pp. 95–102. Creation Science Fellowship, Pittsburgh, PA.

Barrick, W., M.J. Oard, and P. Price. 2020. Psalm 104:6–9 likely refers to Noah’s Flood. *Journal of Creation* 34(1):102–109.

In *CRSQ* 60(2) Fall 2023 on page 97, in “Suggested Strategies for Fitting Precambrian Rocks into Biblical Earth History” by Michael Oard, John Reed, and Peter Klevberg, there was a missing reference to Straume et al. (2019). The missing reference is:

Straume, E.O., C. Gaina, S. Medvedev, K. Hochmuth, K. Gohl, J.M. Whittaker, R. Abdul Fattah, J.C. Doornenbal, and J.R. Hopper. 2019. Globsted: updated total sediment thickness in the world’s oceans. *Geochemistry, Geophysics, Geosystems* 10.1029/2018GC00815:1756–1772.

In *CRSQ* 60(2) Fall 2023 on page 79, the last line in the left-hand column in “Insight into Job’s Theology from a New Identification for Leviathan” by Brian Thomas and Daniel A. Biddle, the name *Sarcosuchus* was inadvertently used. The name should have been *Deinosuchus*.

In *CRSQ* 60(2) Fall 2023 on page 82 in “Insight into Job’s Theology from a New Identification for Leviathan” by Brian Thomas and Daniel A. Biddle, there was a missing reference to Anderson (1976). The missing reference is: Anderson, Francis I. 1976. *Job: An Introduction and Commentary*. Interscience Press, Downers Grove, IL, p. 310.

And in *CRSQ* 60(2) Fall 2023 in the “Author and Title Index for Volume 59, 2022–2023,” on page 120, Jon Ahlquist’s and M.J. Austin’s names should have been deleted.

Instructions to Authors

Submission

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

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

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

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

Appearance

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

Submitted manuscripts should have the following organizational format:

- 1. Title page.** This page should contain the title of the manuscript, the author's name, and all relevant contact information (including mailing address, telephone number, fax number, and e-mail address). If the manuscript is submitted by multiple authors, one author should serve as the corresponding author, and this should be noted on the title page.
- 2. Abstract page.** This is page 1 of the manuscript, and should contain the article title at the top, followed by the abstract for the article. Abstracts should be between 100 and 250 words in length and present an overview of the material discussed in the article, including all major conclusions. Use of abbreviations and references in the abstract should be avoided. This page should also contain at least five key words appropriate for identifying this article via a computer search.
- 3. Introduction.** The introduction should provide sufficient background information to allow the reader to understand the relevance and significance of the article for creation science.
- 4. Body of the text.** Two types of headings are typically used by the *CRSQ*. A major heading consists of a large font bold print that is centered in column, and is used for each major change of focus or topic. A minor heading consists of a regular font bold print that is flush to the left margin, and is used following a major heading and helps to organize points within each major topic. Do not split words with hyphens, or use all capital letters for any words. Also, do not use bold type, except for headings (italics can be occasionally used to draw distinction to specific words). Italics should not be used for foreign words in common usage, e.g., "et al.," "ibid.," "ca." and "ad infinitum." Previously published literature should be cited using the author's last name(s) and the year of publication (ex. Smith, 2003; Smith and Jones, 2003). If the citation has more than two authors, only the first author's name should appear (ex. Smith et al., 2003). Contributing authors should examine this issue of the *CRSQ* or consult the Society's web site for specific examples as well as a more detailed explanation of manuscript preparation. Frequently-used terms can be abbrevi-

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

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

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

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

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

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

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

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

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

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

8. Figures. All figures cited in the text should be individually placed in numerical order, and placed after the tables. Do

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

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

Editor’s Forum:

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

Book Reviews:

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

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

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Creation Research Society

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

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

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

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

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

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

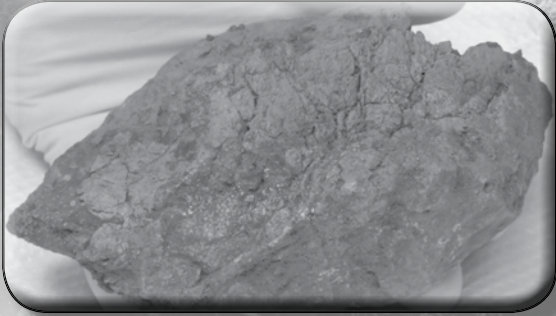
2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.

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

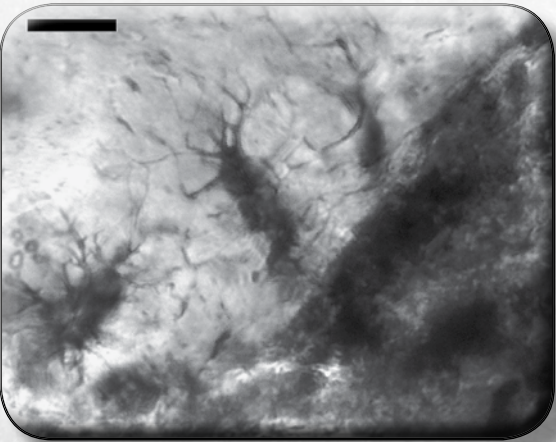
4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Savior. The act of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation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

iDINO II

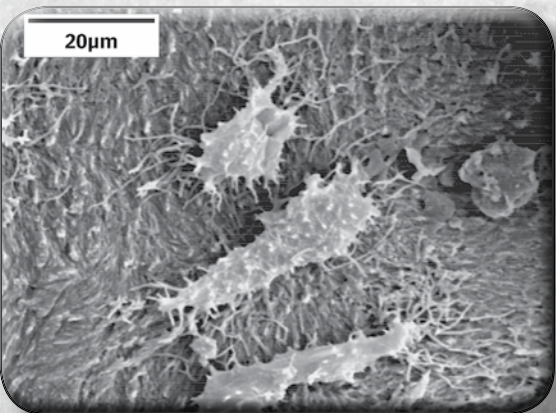
Investigation of Dinosaur Intact Natural Osteo-tissue



A fragment of the *Triceratops* brow horn. Fragments, such as this one, still contain tissue and cells.



Microscopic examination of tissue extracted from a *Triceratops* horn reveals bone cells still present.



Electron microscope picture of intact bone cells still in tissue extracted from a *Triceratops* horn.

How can pliable, stretchable tissue survive inside dinosaur fossils for over 65 million years?

How can this tissue still contain intact cells and even dinosaur proteins?

How can this fragile biological material survive for so long?

The answer to these questions directly challenges the current, evolutionary-biased, geologic timescale.

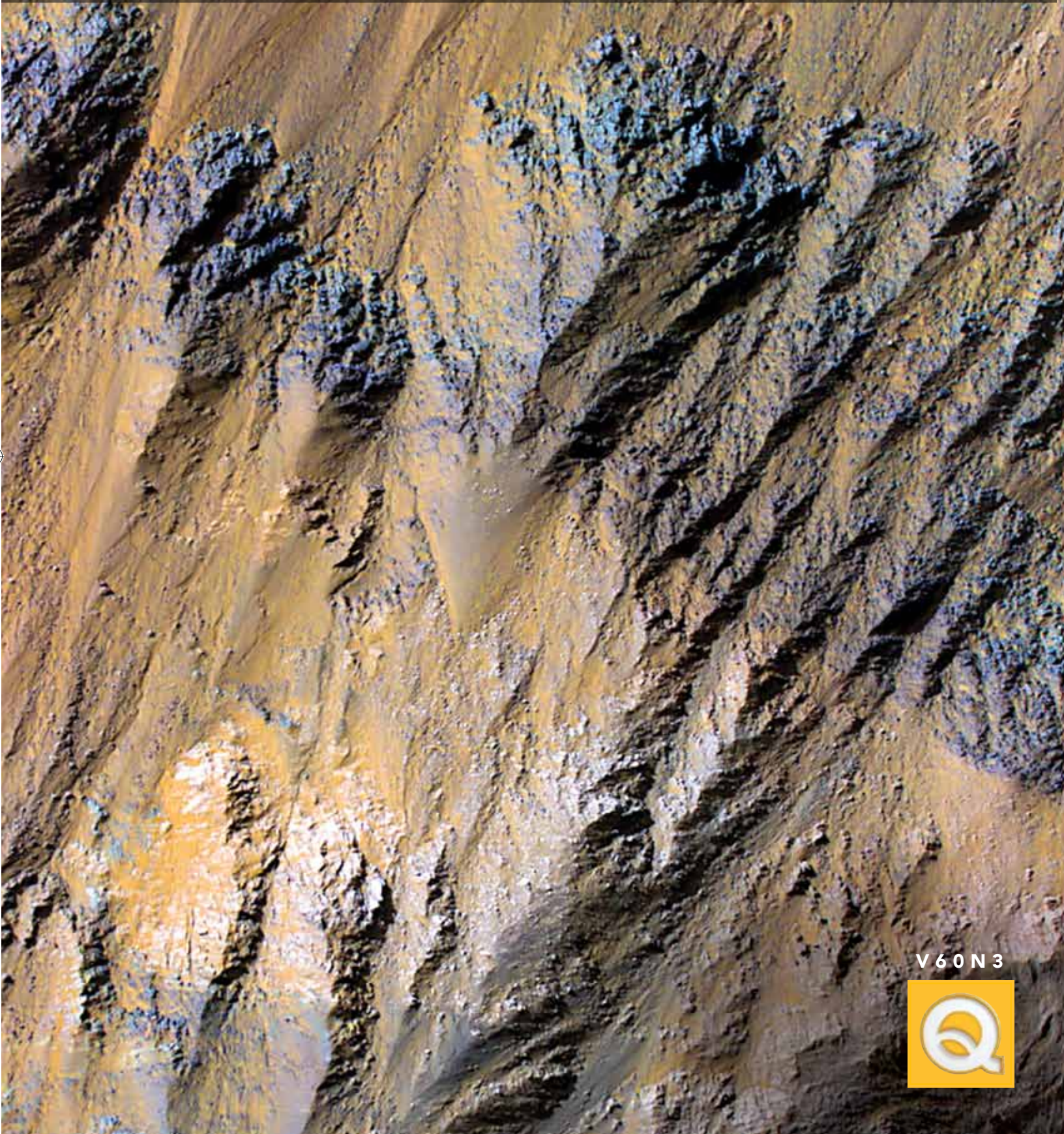
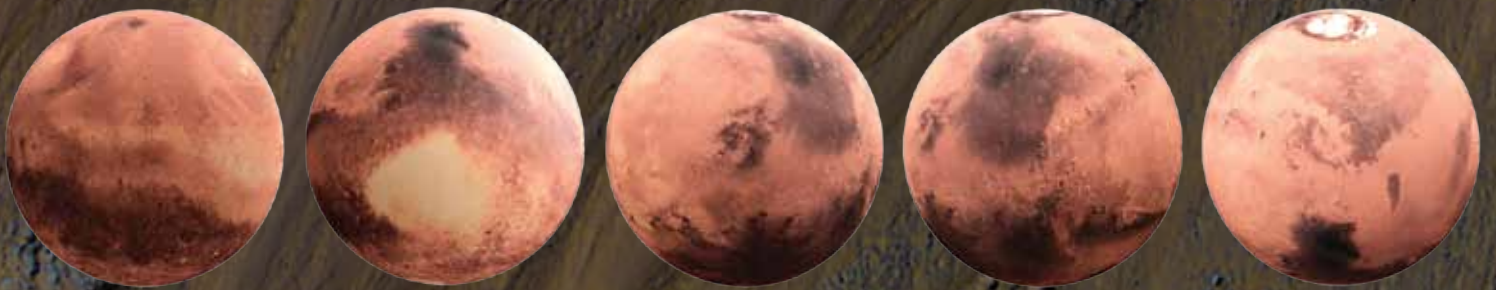
The Creation Research Society began its iDINO research initiative for the purpose of studying soft tissue in dinosaur fossils. The first phase of the project detected pliable, unfossilized tissue in a brow horn of a *Triceratops*. Within this tissue were intact osteocytes (bone cells). Some results from the iDINO project have been published in a technical microscopy journal and presented at an international microscopy conference. The Spring 2015 issue of the *Creation Research Society Quarterly* also features a special report of the iDINO project. Plus, to further spread the important information about soft tissue, the Society is developing a video (Echoes of the Jurassic).

The **second phase** of the project (iDINO II) will look more extensively at the process of tissue preservation. Evolutionists have offered various theories of how this tissue could survive for millions of years. iDINO II will methodically investigate these preservation claims, assessing their plausibility.

The iDINO results have already provided a strong challenge to the evolutionary worldview. More extensive and detailed examination may provide even stronger evidence that the age of dinosaur fossils is far less than 65 million years. To this end, the Society continues to seek those willing to fund this project with either one-time gifts or monthly donations.

For more information contact us at (928) 636-1153 or crsvarc@crsvarc.com.

Also visit <http://tinyurl.com/nphm2c4> for project updates and details.



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