




QUARTERLY

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A REMARKABLE FLOOD DEPOSIT IN THE DEATH VALLEY REGION**
 - **DATING UNCERTAINTIES WITH THERMOLUMINESCENCE**
 - **A LITTLE FLOOD GEOLOGY – PART III: A FALSE DILEMMA**
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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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Dating Uncertainties with Thermoluminescence

Larry A. DeWerd*

Abstract

Thermoluminescence is the emission of light from a solid material that has received a dose from radiation. This phenomenon can be used to date pottery and volcanic eruptions, since the luminescence increases as it is irradiated with time to the point of saturation. The amount of radioactivity in the vicinity of the sample has to be measured, which can be one of the potential sources of error, since any change in the radioactivity of the past can affect the proposed date. The date obtained is dependent on the environment of the site where the sample is located. Other characteristics of the thermoluminescence process can affect the date obtained. The mechanism of thermoluminescence will be described using an alkali halide, LiF:Mg,Ti, as an example of potential sources of error. Alkali halides have been studied extensively for their use as a dosimeter in the medical radiation field. Careful control of the thermoluminescence can result in good accuracy. The thermoluminescence of quartz will be discussed. The criteria and assumptions necessary for the dating process and the potential problems will be described. The uncertainty of the process will be explained and how it may affect the date. Thermoluminescent measurements, when all uncertainties or the process are accounted for, show dates less than 6000 years. A review of the thermoluminescence process shows that this is a useful area of research for the creation scientist.

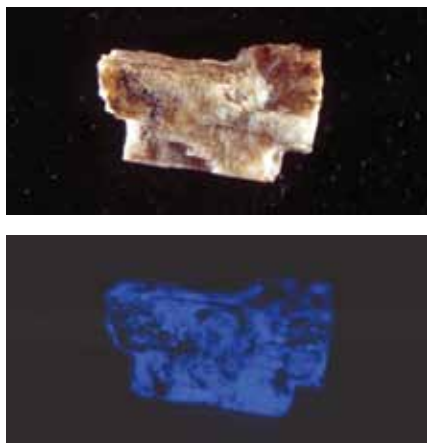


Figure 1. Sample of Limestone Quartz. A (*above*). Limestone quartz under room light. B (*below*). Thermoluminescence of same piece of Limestone quartz in darkened room.

Introduction

An introduction and a review of thermoluminescent dating processes, especially for dating of archeological artifacts, are discussed. A brief note of thermolumi-

nescence (TL) was given by Vernon Cupps (2016). Neanderthal and Cro-Magnon humans have pottery artifacts that can be dated to recent times. The determination of accurate dates is de-

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pendent on a number of characteristics of the luminescent material. Generally, variation in processes can be estimated by the use of uncertainty calculations. In the 1990s, the old method of systematic and random errors was replaced by the calculation of uncertainty. These calculations assign parameters for the entire experimental process (Taylor and Kuyatt, 1994). This process will be explained later. Examples of parameters in the TL process that need mention will be illustrated by the use of material, LiF, used for medical dosimetry. Assumptions made for the measurement and the accuracy of the process should be stated. The present manner of doing this estimate to the level of accuracy is called an uncertainty analysis. An explanation of the determination of uncertainty will be given with its application to archeological dating.

Brief History of Thermoluminescence

A brief and incomplete history illustrates that thermoluminescence (TL) has been used in many areas. Sir Robert Boyle was one of the first to observe TL and reported on it in 1663. Madam Curie used TL to measure her radium extractions in approximately 1902. TL was used for dating rock minerals in the 1950s and 1960s, but accuracy for this methodology was not very good because of the environmental changes (mostly in the radiation delivered) that may have occurred for the rock or artifact. This change occurs when the rock is displaced by some external force. In addition, the TL can reach saturation in response to an increase in radiation, which would cause an error in dating. Saturation for the TL process occurs when the signal does not change with increased dosage. Many times, increased dosage beyond the saturation level actually causes damage and thus, a decrease in signal with increasing dosage. The radioactive environment can be measured in a number of ways, e.g. a survey

meter, TLD, a spectrometer, etc. Most importantly, one is to measure the in-situ dose rate.

This manuscript will concentrate on quartz dating in archeological artifacts. Farrington Daniels explored dating in 1953 (Daniels et al., 1953). At the University of Oxford, England, Martin Aitken (1985) developed the thermoluminescence dating of archeological artifacts. Research in this area turned to Optically Stimulated Luminescence (OSL) in latter years. OSL and TL are related processes (see below). TL gained great use in the area of medical dosimetry (measurement of radiation dose using TL). One of the differences between medical dosimetry and dating is the difference in total dosage delivered at the point of measurement. Medical dosimetry involves doses of a few gray each day for 5 weeks, whereas dating usually involves a total dose of thousands of gray, albeit delivered over a greater timespan. The higher dosage can result in saturation of the TL signal. Farrington Daniels, University of Wisconsin (1950s), proposed the use of TL in medical dosimetry, which was extended by John Cameron (Cameron et al., 1968). The author entered the field with Cameron in 1963. A large amount of research has been done in the medical dosimetry field and will be used as an example of consideration for TL in quartz. There have been many books written on TL; one of the first was by Cameron (Cameron et al., 1968). The most recent book is by Chen and Pagonis (2019).

Luminescence

TL is one aspect of the luminescence process, including fluorescence and phosphorescence. The time between irradiation and emission is the distinguishing parameter. Times of $< 10^{-8}$ s are termed *fluorescence*; times between irradiation and emission that are longer are termed *phosphorescence*. TL might be considered to be a “frozen in” phos-

phorescence. When the luminescence is stored in the phosphor to be read out later, it is termed *xluminescence*, where x is the method of read out (e.g. heating the sample gives rise to TL). TL occurs when heat is applied in a readout uniform fashion which results in recombination of electrons and holes to produce light. If, instead of heat, a light (laser) is used to release the phosphorescence, it is termed *Optically Stimulated Luminescence* (OSL); generally, the light is a green laser or infrared laser or just a light source. OSL has certain advantages and disadvantages in its use. TL has been studied much longer than OSL, so I will limit myself to the TL process, which is better known. TL is found in many materials. Figure 1 shows an example of limestone quartz. Figure 1A is the quartz under room light and Figure 1B is in a darkened room with the only light coming from the heating of the sample. One problem with using TL to date rocks is the TL signal may saturate and, therefore, not respond in a linear fashion with dosage. Other problems are mentioned below. Dating a volcanic eruption is not as problematic but still can have problems. Quartz is in almost every archeological artifact, especially pottery made from clay (which contains quartz). The abundance of quartz and feldspar in many objects allows for accurate dating. Other materials used for dating purposes are zircon, calcite, and flint. Many dates are determined from the abundant materials. Feldspar needs special care since it has anomalous fading, that is, its signal decreases with time. The process for quartz is well established. While a review of the glow peaks of quartz has been published (Koul, 2008), many papers ignore some of the competing processes that can affect the determined age of the artifact. The best way to explore the effect of these processes is to develop an uncertainty table for the process. An uncertainty table will be developed after exploring characteristics of a medical dosimeter as an example.

The Dating Process

Pottery has been found at a number of archaeological sites and attempts have been made to provide dates. Comparison of TL dating with radiocarbon dating can provide a crosscheck; however, radiocarbon dating has its own complications. For example, exploration in southern China has uncovered pottery fragments that are claimed to date back to 20,000 years, using radiocarbon dating (Wu et al., 2012). Pottery has also been dated by TL techniques. In fact, it has been considered one of the most accurate methods for dating pottery (Khaswneh et al., 2011). A paper exploring TL dating from some of these sites has previously been published (Agrawal et al., 1981). Dates of 765 BC are given, compared with radiocarbon dates of 905 BC. Other dates given in that paper range from 1035 BC to 875 BC. None of these articles give an uncertainty analysis, so it is difficult to judge the accuracy of these dates. Generally, the most common display of an uncertainty analysis should include a standard deviation of measurements. However, uncertainty analysis includes more than just the standard deviation; it should include all aspects of the measurement.

The first step for dating of pottery is done by the artisan when he makes the artifact out of clay, which contains quartz. When the artifact is fired to harden it, the intrinsic luminescence is released and set to zero. Since the heating has removed all the intrinsic TL from the quartz, this date is the beginning of accumulation of TL and establishes the date to be determined. Figure 2 illustrates this firing as the vertical line with the TL signal at zero. The amount of TL increases from there based upon exposure to radiation in the surrounding environment.

Determination of the Date

As the artifact (or the shard of the broken piece) ages, radiation from within the artifact and from the surrounding

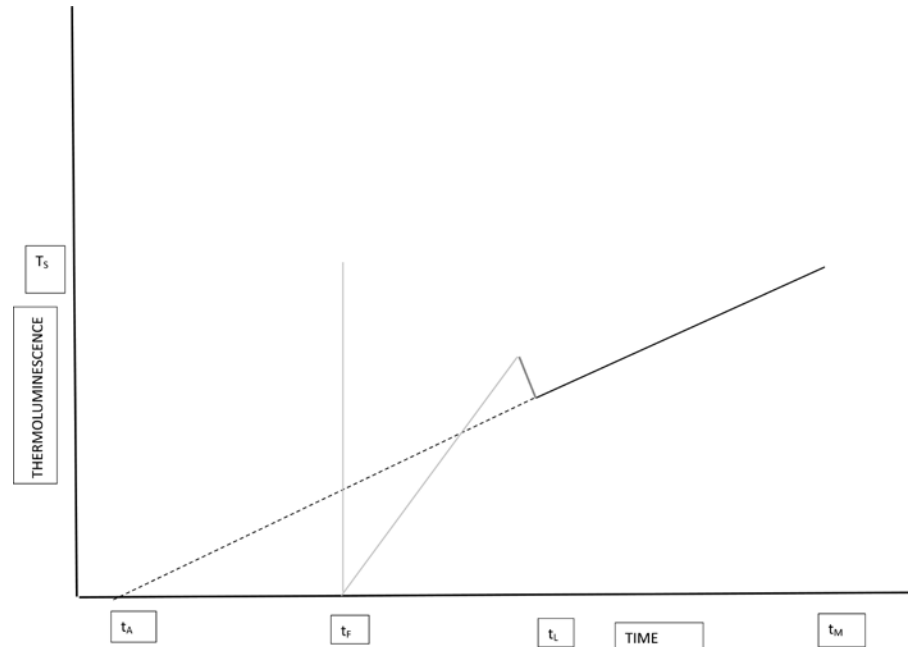


Figure 2. Example of thermoluminescence versus time of a buried artifact. At the point of firing the TL is set to zero. If the artifact is moved, its environment is different and the extrapolated date is wrong.

environment increases the stored luminescence (refer to Figure 2). When the shard is recovered after a number of years, a sample is removed from the artifact, and the quartz is heated for the TL. Thus, the TL signal from the artifact is determined, designated as T_s . The radiation rate of the environment (in situ) and the contained radiation is measured. However, the radiation rate of either the environment or the object itself is not necessarily constant and therefore may change over thousands of years. This change in radiation rate is one of the fundamental flaws regarding assumptions concerning TL and OSL dosimetry over long periods of time. The burial dose rate is then determined (dD_B/dt). The radiation emitted is usually alpha, beta, or gamma emissions. Each of these emissions has a different depth of penetration depending on the absorbing material. As an example, alpha particles

travel about 1mm, beta particles about 5 mm, and gamma rays are not totally stopped. Thus, the amount of radiation dosage will vary with depth, and estimates will need to be made. In addition, the cosmic ray flux should be considered depending on elevation, latitude, longitude, and burial depth. Obviously, these quantities change over time; often in unpredictable ways and thus can affect the total radiation received. Another conflicting problem is energy dependence. For example, lower energy radiation generally has a greater TL response for a given dose.

There are different methodologies to determine the TL sensitivity of the sample, but all have a means of calibrating the quartz sample for TL response versus the dosage given. The doses given are generally desired to yield TL that would be near to T_s . Therefore, a ratio is formed for the calibrated dos-

age given, D_C , to the TL response, T_C . Thus, the sample dosage is determined by equation 1.

$$D_S = (T_S/T_C) * D_C \quad (1)$$

The age of the artifact is determined according to equation 2,

$$\text{Age} = D_S / (dD_B/dt) \quad (2)$$

where D_S is the dose measured from the sample and dD_B/dt is the burial dose rate.

There are a number of assumptions involved in each of the steps above. The first and most obvious is that the radiation rate was constant during the entire course of burial, and the burial was not disturbed. Since most of the radiation products are long-lived and are in secular equilibrium, the assumption of a constant radiation rate is assumed. This assumption may not be true because of displacement of the artifact and it does not account for any short-lived nuclides that may have affected the dose. In addition, Vernon Cupps (2019) has a new book that contends that radiation decay rates may have been different in the past. Many items of the past have a great uncertainty associated with them. Figure 2 graphically illustrates what may happen during this process. At the time of firing, t_F , the TL signal is reduced to zero. Thereafter, the TL signal of the original quartz in clay is gradually increasing with time, depending on the radiation received. However, the sample could be displaced in some manner (e.g., earthquake) to another site which has a different (lower) radiation exposure. During this displacement, t_L , the sample may lose signal because of heating from the sun or being closer to the surface. This dosage rate at the new site is different so that extrapolation back in time would give an increased age, t_A . The longer the burial, the greater the probability of this occurring. This process is an unknown effect since the background of the sample is not “well

controlled.” The end result here is extrapolation to a greater age, t_A , than the actual archeological age, t_F . An estimate of the probability of any of these events occurring can be listed in an uncertainty analysis.

Determination of Accuracy of Artifact Dating

The above determination of TL with radiation dosage at the burial site is not the only problem for determining an accurate date of an archeological artifact. There are a number of factors that can affect the age determination, as reflected in the following quotes from the literature:

...thermoluminescence is at the most about 15% accurate. It cannot be used to accurately date a site on its own. However, it can be used to confirm the antiquity of an item. (Wikipedia)

This technique (Thermoluminescence Quartz dating)... is only accurate on objects 300 to 10,000 years in age. (RationalWiki)

These quotes illustrate the necessity of considering the uncertainty of the whole process involved. Other TL characteristics that can affect the dating process can be explored by examining some characteristics of a controlled and well-studied phosphor in medical dosimetry, namely LiF:Mg,Ti. The characteristics (such as supralinearity, etc.) that can affect the TL signal can be extended to quartz as well in an attempt to determine the uncertainty involved in the TL process. The parallel between the two processes will be explored by looking at the medical dosimeter, which is well controlled, versus the artifact TL, which is not as controlled. The basic TL process will be explored for this purpose.

Basic Thermoluminescence

All the luminescent processes involve the solid-state band structure, which includes empty energy levels called the

conduction band, filled energy levels called the *valence band*, and an energy gap, which is the separation between the two bands. If the conduction band and the valence band overlap (no energy gap), the material is a metal with an ease concerning conduction. The magnitude of the energy gap determines whether the material is a semi-conductor or an insulator. Luminescent processes generally occur in insulators as a result of traps (energy levels located in the energy gap from impurities). The luminescent process results from defects and impurities causing the electron, hole traps, and the recombination center, which is another defect, where electrons and holes recombine. The energy from the absorption of the radiation is stored in traps, or defect centers. The electrons are released when the material is heated, and the electrons recombine with the holes (positively charged), generally at a recombination center. This process results in the release of light with wavelengths characteristic of the recombination center. This process is represented schematically in Figure 3. OSL is the same process except that electrons are released by optical stimulation. These defects or traps and recombination centers are generally caused by impurities in the crystal lattice. The impurities cause color centers, and the TL can vary greatly depending on the amount of impurities (e.g., in LiF:Mg,Ti, the best TL occurs with 200 ppm of Mg and 20 ppm of Ti). A simple color center is the F center, which is the absence of a fluorine atom with an electron taking its place. A more complex one with an impurity (a dipole) is in Figure 4 (see DeWerd and Stoebe, 1972). Dipoles and combination of dipoles (dimers and trimers) are responsible for the traps in LiF:Mg,Ti.

Since defects and impurities are so important for the TL process, we need to consider the effect in quartz. The impurity level and type of impurity in

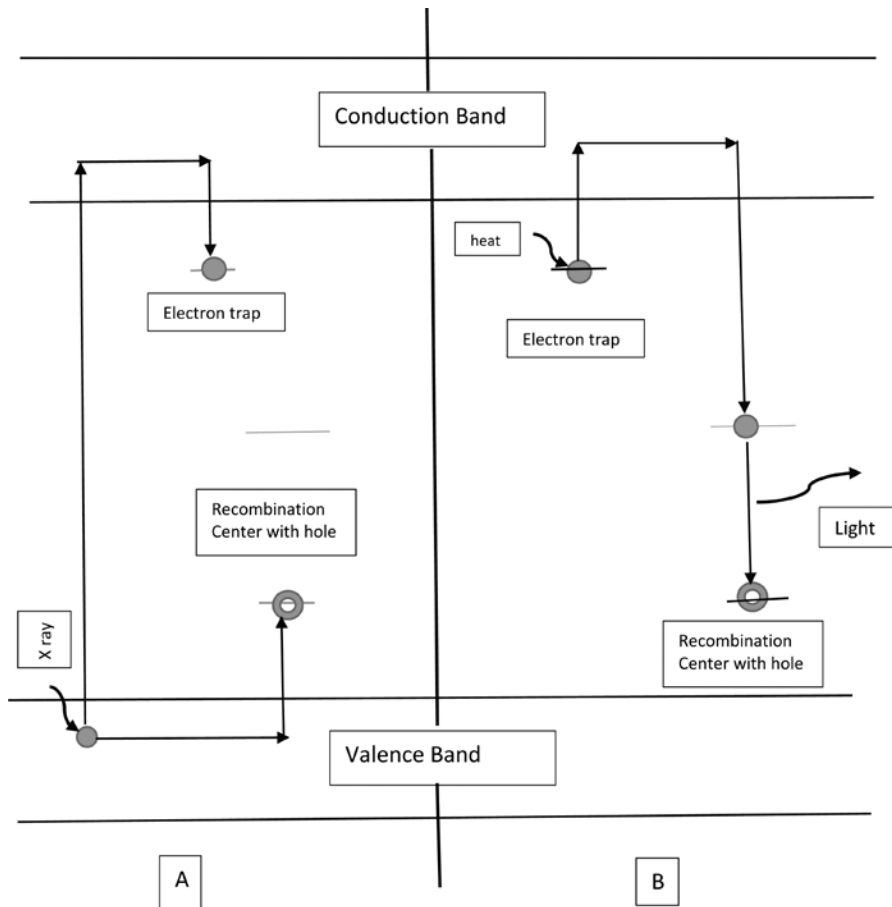


Figure 3. Energy level diagram for thermoluminescent materials. A: X-ray creates electron and hole which get trapped. B: Energy level diagram showing application of heat and recombination of hole and electron to produce light.

quartz can affect the TL greatly and result in orders of magnitude variation in luminescent intensity. The trapping centers are also not completely known; the impurities can be Al centers, Si vacancies, or Ge vacancies. For the dating process, the impurities of the quartz should be determined and given when the resultant TL is presented. Generally, the impurities affect the glow curve or the spectrum. It is difficult to always determine the impurities without destroying the sample. In all cases, the TL intensity vs. calibration dosage needs to be given which is part of the determining factor for the age.

Glow Curves

The signal resulting from TL is called a glow curve. As the electron traps are heated, greater numbers of electrons are released until few filled traps are left. This results in a non-symmetric peak. If there are a number of traps in the phosphor, there can be a number of peaks at different temperatures as shown in Figure 5 for LiF:Mg,Ti. The numbered peaks correspond to different trap depths. At room temperature, these peaks decay away with time (DeWerd and Stoebe, 1972). Peak 1 is gone within 10 minutes after irradiation, and the 105°C peak has a half-life of 10

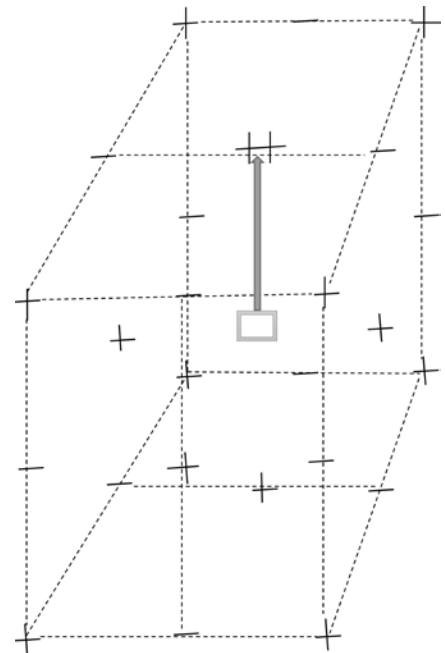


Figure 4. Diagram of a Z-center, an impurity electron trap center (see DeWerd and Stoebe, 1972). Note the dipole of this center. The double + is Mg in LiF.

hours. The 190°C peak has a half-life of 80 years. The temperature rate of the readout can affect the overlap of the glow peaks. For quartz, the temperatures of the glow peaks at a 15°C/s heating rate are 110°C, 325°C, and 375°C. The decay of the low temperature trap can add electrons to the higher temperature traps, which when read-out can change the age determination, making the age greater than directly determined. This is also true if a preheat is applied when read-out but not when calibrated. The 325°C peak is decreased by solar light, so it must be kept in the dark to be used. The 375°C peak is the one usually used.

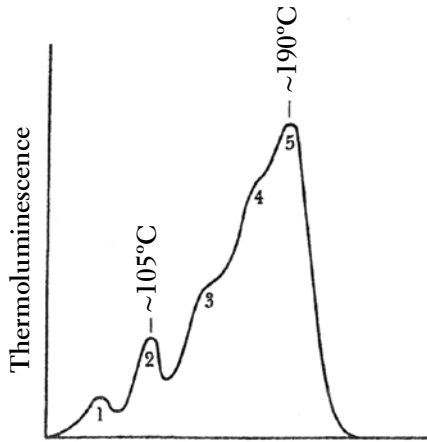


Figure 5. TL vs. temperature for LiF:Mg,Ti, with numbered peaks.

The 110°C peak has also been used but with special manipulations (Koul, 2008).

Supralinearity

Another effect of impurities can relate to the recombination center and the

TL response. Doped Lithium fluoride (LiF:Mg,Ti) has an increase in response above linearity at doses above 5 Gy; this is termed *supralinearity*. An example for peak 5 from Figure 5 with dose is shown in Figure 6. The curve marked LiOH has been grown with additional OH ions. Note that the supralinearity is gone, but the sensitivity of peak 5 is also decreased. Thus, the control of impurities affects the characteristics of the TL process, including supralinearity. Quartz samples are not as well controlled as LiF:Mg,Ti, and thus, can exhibit variation in these processes. Supralinearity also occurs in quartz. For example, Figure 7 shows supralinearity of the 110°C peak in quartz. The data points are from Martini and Fasoli in Chen and Pagonis (2019). Note how an error could occur if the calibration was done only at the lower doses. If the TL/dose was extrapolated from the lower values, the dosage expected from the TL would be about 250 Gy, as opposed to 200 Gy. This would be a 25% error resulting in an increased

age. This difference is indicative of the problem when the standard assumption is made that dosage is given uniformly with time and the response of the TL material is uniform. A knowledge of the dosage response, including supralinearity, is important when calibrating the TL material. A linear fit can result in significant errors (Gruen, 1996). Gruen considers the error that could result by the failure to account for supralinearity and saturation region. Supralinearity must be accounted for in the dating process.

Uncertainty Determinations

In the past, scientific measurements were expressed with random and systematic errors. Aitken and Alldred have considered the error limits of TL dating in the past (Aitken and Alldred, 1972). At present, the methodology no longer uses “errors” but uncertainty expressions which involve the entire experimental process. This Uncertainty determination includes all aspects of the experiment, including an estimate of the assumptions used. For example, the assumption that the artifact received constant radiation can be expressed in terms of a probability of being displaced or not receiving constant radiation. The determination of the uncertainty is important regarding the characteristics of the TL process for dating since many investigations only include the standard deviation of the measurements and not estimates of the other influence quantities. The question arises as to the certainty of the dates, which should include an analysis of the uncertainties involved. Information on the process of determining the date and the resulting uncertainties are not reported in many of the articles dating artifacts. Thus, it is difficult to adequately determine the accuracy of the date. The discipline of determining the uncertainty of measurements will be discussed first, using the medical dosimeter as an example.

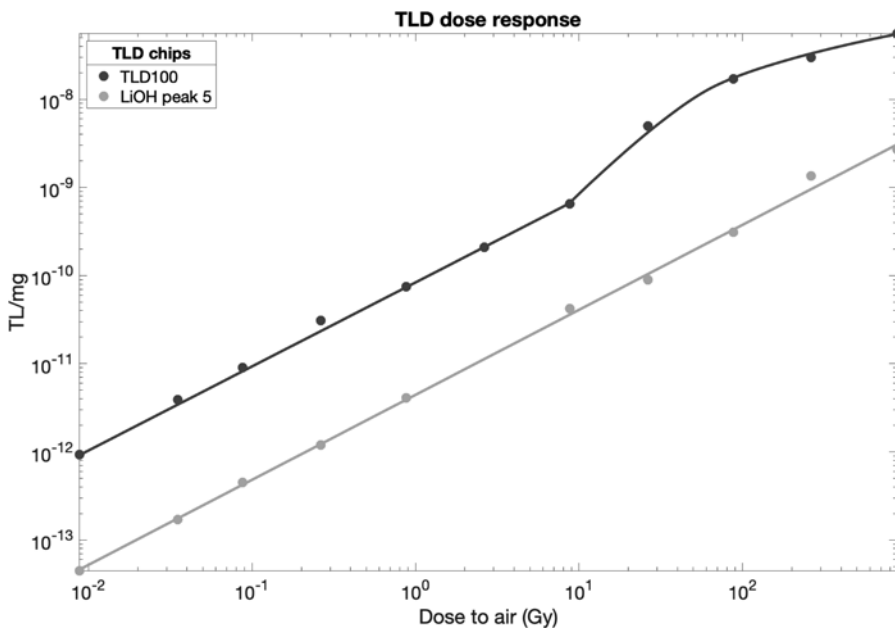


Figure 6. TL dose response for peak 5 in TLD100 (LiF:Mg,Ti) showing supralinearity. The curve designated LiOH peak 5 is the addition of OH ion to LiF:Mg,Ti. Note the decrease in sensitivity and the lack of supralinearity.

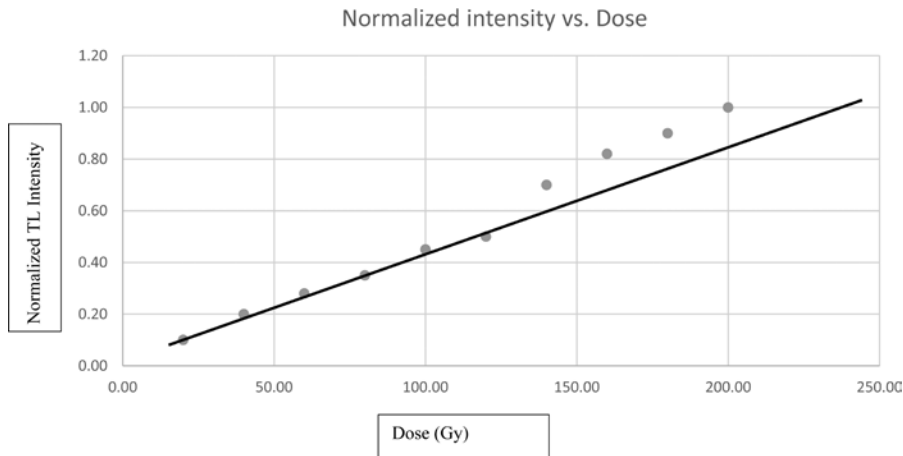


Figure 7. Supralinearity of the 110°C peak in quartz. Data from Martini and Fasoli in Chen and Pagonis (2019).

The Uncertainty Process

The following is a brief explanation of the entire process for uncertainty determinations as given in the National Institutes of Standards and Technology (NIST) technical note publication (Taylor and Kuyatt, 1994). The first distinction is the difference between accuracy and precision. Accuracy is how close the value is to the conventional true value—the absolute correct value. This absolute correct value is generally traceable to a national primary laboratory, e.g. NIST in the U.S. Precision is how close the values are to each other (reproducibility). The uncertainty process is to determine the accuracy of the measurement. This is accomplished through two quantities, termed *Type A* and *Type B uncertainties*, from historical terminology. Type A uncertainty is estimated by the standard deviation of the mean value. These are measured results and generally are the only value given as a standard deviation in many publications. Any valid statistical method for treating data can be used to express Type A uncertainties. Type B uncertainty cannot be estimated by repeated measurements (standard devia-

tions). Type B is based upon scientific judgment but using that which applies to the measurement. Generally, Type B uncertainty is based on a confidence interval. Type B is based on scientific judgment using all relevant information available. From these quantities an uncertainty table is constructed. Uncertainty tables and determinations are important to give a representation of the goodness of the measurements. Determination of uncertainty gives an indication of how close you would expect your measurements to compare to other similar measurements and how close they are to the correct value. It also indicates how close the data is to the conventional true value. Finally, an uncertainty table is constructed to provide a coverage factor; this factor is generally calculated at the 66% level termed $k=1$. All the values are added in quadrature and then the square root is determined. After the table is constructed, the last line is to be multiplied by 2 for a coverage factor of $k=2$, which covers 95% spread of the entire experiment. This value is called the expanded uncertainty and would cover 95% of the values in the experiment.

Uncertainty of TL of LiF:Mg,Ti

Experience with the medical dosimeter of LiF:Mg,Ti will be used because of the major amount of research done on this phosphor. An uncertainty table can be constructed (see Table I) for a brachytherapy application of determining the dose rate constant using TL as the dosimeter. Gerhart et al. (2000) published an uncertainty table for this quantity with a final expanded uncertainty ($k=2$) from this publication of 7.7%. Using the same material, LiF:Mg,Ti, but with increased care, the uncertainty of these determinations has been decreased as given in Table I (DeWerd et al., 2009, 2011). The TL response was determined to be within 1.5% as opposed to 4.6% in the Gerhart publication. The expanded uncertainty for Table I is 4.6% at $k=2$, whereas the total expanded uncertainty at $k=2$ for the Gerhart publication is 7.7%. Note the importance of stating all procedures with an uncertainty given to maintain the lowest value of uncertainty for the experimental procedure. It falls on the researcher to do these estimates of uncertainty to complete their experimental procedures.

Estimated Uncertainty in the Quartz Dating Process

Using the information as given in this publication, an estimate of the uncertainty of the dating process using the TL from quartz can be determined. The steps would include estimates of the probability of the assumptions made. Table II is an attempt to consider all the parameters that would be involved in the TL dating process. Individual experiments certainly can be less than given in Table II, but these values are estimates for a maximum uncertainty. Note that the conclusion would be, using these estimates, that an age of 20,000 years could really be an age between 2,900 to 10,000 years. This discrepancy indicates that an honest evaluation of the uncertainty involved in the dating experiments must be done, rather than

Table I. Example of determination of the experimental uncertainty using TL for brachytherapy dose rate constant.

| Parameter | Type A Uncertainty | Type B Uncertainty |
|------------------------------|--------------------|--------------------|
| TL Reproducibility | 1.5% | |
| Dose Calibration | | 1.0% |
| Energy Dependence Correction | 0.5% | 0.5% |
| Positioning of TL | | 1.0% |
| PMT Linearity | | 0.5% |
| | | |
| Sum in Quadrature | 1.58% | 1.58% |

| | |
|--------------------------|-------|
| Total Uncertainty k=1 | 2.24% |
| NIST uncertainty | 0.5% |
| Combined Uncertainty | 2.30% |
| Expanded Uncertainty k=2 | 4.60% |

Table II. Estimates of uncertainty involved in the quartz dating process.

| Quantity | Estimate of Uncertainty at k=1 |
|--|--------------------------------|
| Environmental considerations—possibility of changes | 10% |
| Probability of radiation not being constant | 10% |
| Measurement of radiation in the environment | 5% |
| Amount of impurity and TL process, including sensitivity | 10% |
| Energy response from different emissions | 20% |
| Saturation of TL | 15% |
| Calibration of dose— if supralinearity not accounted for | 25% |
| Reproducibility of reading | 5% |
| Match of PMT to emission spectra | 10% |
| Calibration Dose | 5% |
| Traceability to NIST (particulate radiation) | 10% |
| Combined Uncertainty k=1 | 42.72% |
| Expanded Uncertainty k=2 | 85.44% |

just claiming a date because it is what the scientist would expect. All of the dates determined using TL are generally less than 10,000 years. However, this age is probably an overestimate based on the uncertainties involved.

Summary

It would appear that the most accurate dating method for artifacts would be via the TL process. An important exercise for the TL dating of artifacts would be to perform an uncertainty analysis to determine the accuracy of the dating process. An uncertainty analysis is very important for understanding the accuracy of the measurement. Researchers must be familiar with the entire process and characteristics of material they are using. Generally, the expectation of the whole process would require that dates be given an uncertainty analysis to determine the accuracy or the variation from the conventional true value. If results are analyzed and all uncertainties taken into account, the ages of the TL dating of artifacts would be expected to be younger than 10,000 years. The age of the pottery sherd would expect to agree with young ages.

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A Little Flood Geology

Part III: A False Dilemma

Peter Klevberg*

Abstract

Floods are a key category of geologic processes. Parts I and II of this series provided some examples of geologic work by floods and related processes in Central Montana as witnessed by the author and how these may apply to the study of earth history. In Part III, geologic processes associated with these engineering projects are presented that are not flood processes. Evolutionists tend to overlook or resist evidence for catastrophic, large-scale processes (especially diluvial processes), while creationists can be tempted to overlook or downplay the role of smaller-scale processes that are presently active. This is a false dilemma, as these examples illustrate. The problem is one of philosophy and method, not of evidence.

Introduction

Part I of this series (Klevberg, 2019) introduced some basic hydraulic equations that apply to floods to show that these processes are nonlinear, with energy thresholds. Observation shows that nearly all geologic work occurs *during* floods, with very little occurring between them. Part II (Klevberg, 2020) provided examples of flood impacts, small mass wasting events, and ground water effect on surface water processes in Central Montana in 2011 (Figure

1). While these episodic processes are very important in producing geologic effects, there are some ongoing processes that are important at a smaller scale. In this paper (Part III), some of these are illustrated using examples from Central Montana.

How Conflicting Paradigms Affect Field Work

In recent decades, there has been a healthy increase in attention to what the

“scientific method” is (or if there is such a thing). The idea of innate objectivity has been largely dispelled.

No analysis is done outside of some sort of theoretical construct. Theory does not evolve in isolation from a research program.... In this view of the scientific method, evidence and theory are interwoven through data models that direct the researcher as to the type of information to collect and the appropriate modes of analysis. (Inkpen, 2011, p. 321)

This applies as much to uniformitarians (which most evolutionists are) as it does to catastrophists (which creationists generally are). We tend to see what we look for. This is known as verification science.

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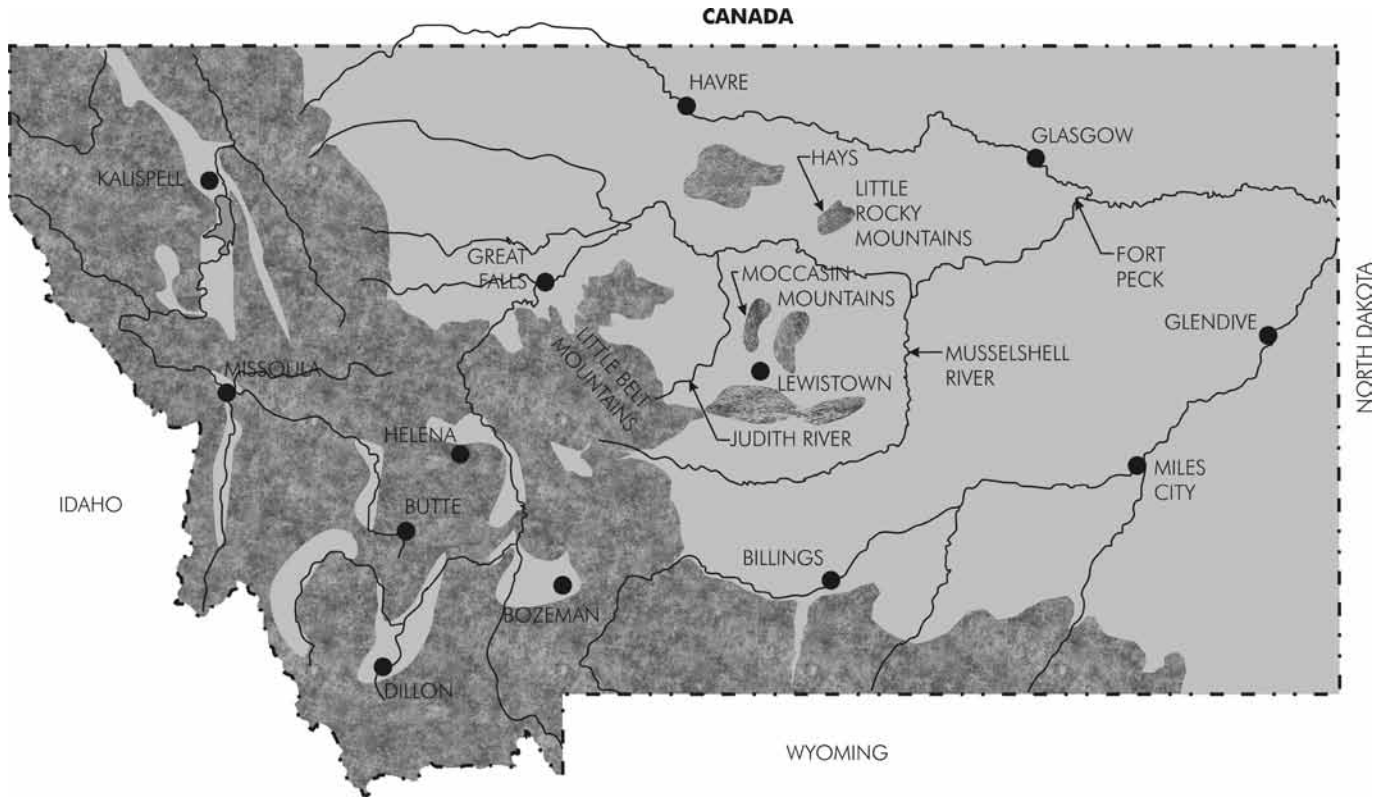


Figure 1. Map of Montana showing major rivers and mountainous areas.

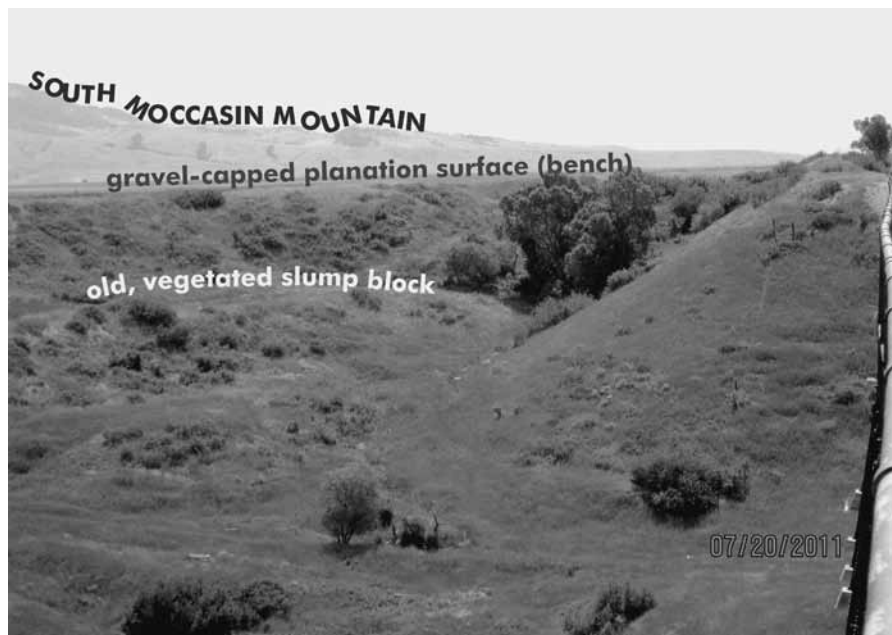


Figure 2. View east from east-southeast end of Central Montana Rail bridge over Judith River Valley. Some geologic features can be linked to extant processes while others cannot.

A False Dilemma

While uniformitarianism has been scientifically discredited for decades, rigid catastrophism is not the only alternative. Some of the events from the distant past appear to be of a different character from modern ones, but others appear similar, though often larger than more recent events (Figure 2). Not all geologic phenomena have formed from floods or other catastrophes. Many of the claystone and shale strata in the Judith Basin are montmorillonite rich, and some are even bentonite (nearly pure montmorillonite). These provide planes of weakness that can be mobilized when infiltrated by ground water. Even when slopes are nearly horizontal, movement can occur as landforms are deformed. A lower energy state is reached through very slow landsliding analogous to creep,

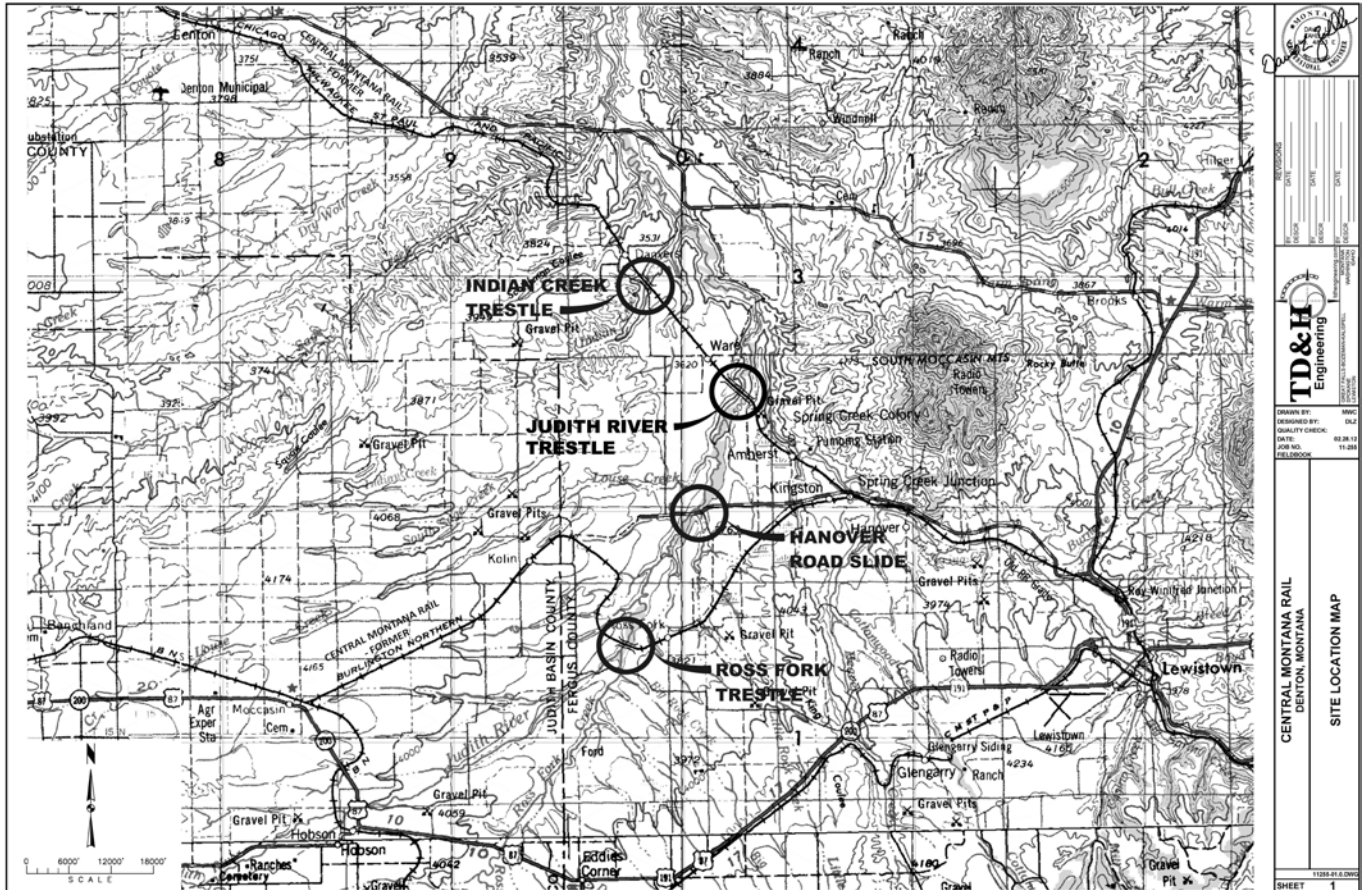


Figure 3. Map of Judith Basin project sites. Base courtesy TD&H Engineering.

even during relatively dry years. This has been a problem at two major steel trestles on Central Montana Rail’s line: the Ross Fork Bridge and the Indian Creek crossing (Figures 3–5).

The Ross Fork Bridge is a viaduct that was built by the Great Northern Railway and is similar to the Milwaukee Road bridges. It is set on the same geologic formations. In addition to less dramatic damage from the Ross Fork of the Judith River in 2011, creep or slow landsliding had been an ongoing problem, eventually necessitating support of some of the Ross Fork trestle bents on timber cribbing (Figure 5). The Ross Fork Bridge is undergoing more substantial repair work (Figure 6), while

the Indian Creek viaduct underwent significant repairs a couple of decades ago. The footings for both of these trestles had gradually moved downslope, and when steel members of the Indian Creek Bridge were supported using a crane and sequentially unbolted from each set of footings, the bents (towers) sprang back to their proper positions. New footings were poured to support this bridge. Slope inclinometers and horizontal drains were installed to monitor slope movement and reduce pore pressures to slow the movement (Figures 4 and 7). These measures have been largely effective at Indian Creek.

Recent work at Ross Fork indicates a different failure mechanism than at In-

dian Creek, even though the geology is the same (Figure 8). Slope inclinometer data from the Ross Fork site intimates a curved failure surface typical of a slump. Unlike slumps shown in Figure 9, this mass wasting feature appears to be slow and ongoing, though apparently stochastic (fits and starts). The failure surface is larger and broader than what is typical for the valley.

My supervisor many years ago designed the repairs for the Indian Creek viaduct and told me about the history of the project. He also described a similar circumstance with Saint Ann’s Cathedral in Great Falls, Montana (Figure 10). Excavation of a pipe trench in front of the heavy sandstone building induced



Figure 4. Central Montana Rail bridge over Indian Creek southeast of Danvers, Montana.



Figure 5. Central Montana Rail trestle over Ross Fork of the Judith River.

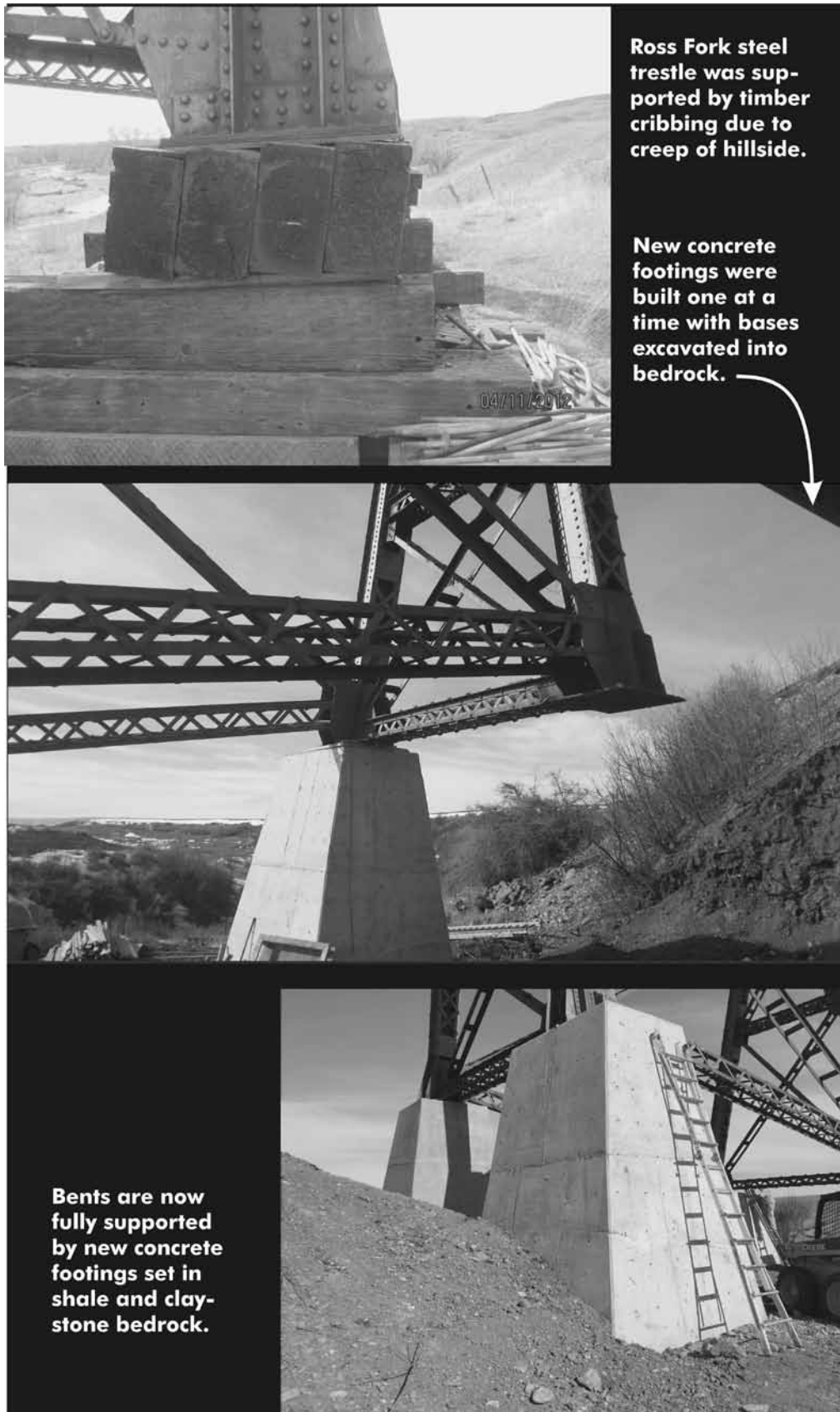


Figure 6. Foundation reconstruction for Ross Fork Trestle to compensate for mass wasting of valley slopes.

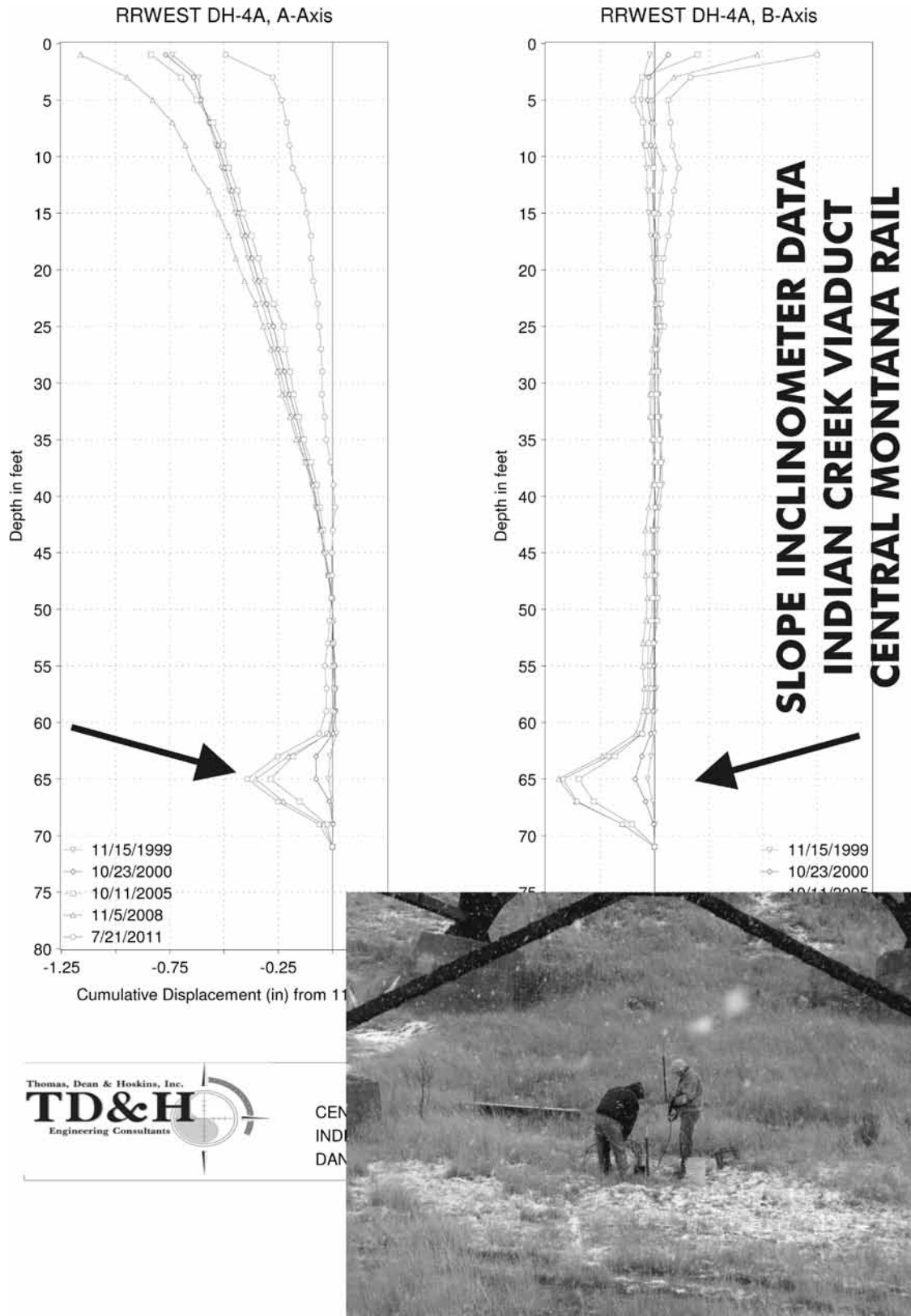


Figure 7. Data for one inclinometer at Indian Creek. Arrows draw attention to bedding plane failure surface indicated by displacements. Inset: author and boss monitoring Indian Creek trestle slope inclinometer ten years ago during spring snowfall, typical weather for Central Montana.

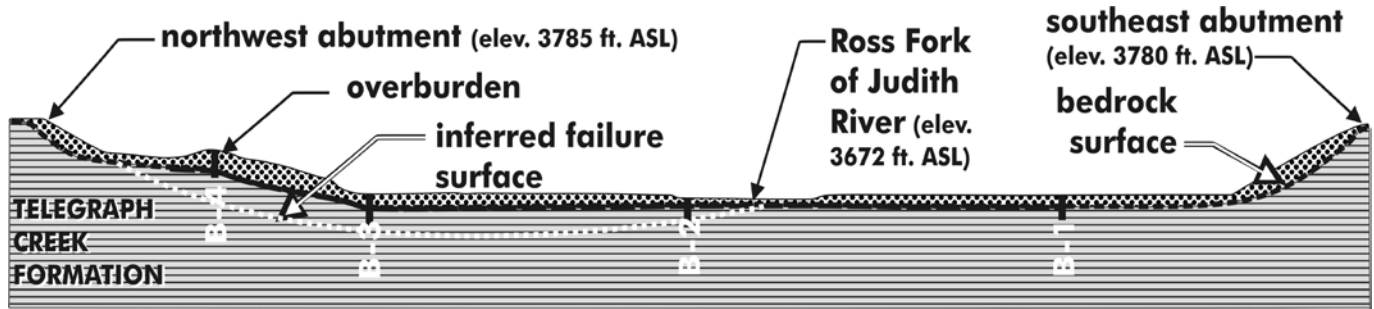


Figure 8. Cross section of valley of Ross Fork of the Judith River where Central Montana Rail viaduct crosses based on TD&H Engineering survey data (no vertical exaggeration). Auger borings B-1 through B-4 are indicated. Failure surface is inferred from inclinometer data collected starting in 2013. Failure appears to be a very slow, erratically moving landslide probably influenced by removal of material at toe by the Ross Fork, virtually all of which occurs during floods.



Figure 9. Small mass wasting events on the valley sides of the Ross Fork of the Judith River are relatively common.

horizontal movement that threatened to damage the structure. This was quickly noted and corrected, but it shows how readily movement may occur along horizontal or subhorizontal planes of weakness, especially when softened or lubricated by water and when pore pressures are elevated. The bedrock on which Saint Ann's rests is a relatively weak, smectite-illite-rich claystone of

the Kootenai Formation. Water incorporated into the crystal structure of smectite physils (e.g. bentonite and other moisture-sensitive clay-size mineral particles) can greatly change their rheology, sometimes creating a plastic mass with relatively low viscosity.

The Central Montana Rail bridges appear to be founded on lower strata of the Telegraph Creek Formation (Porter

and Wilde, 1999) based on the Ross Fork excavations (Figure 11). The Telegraph Creek Formation is dominated by fissile shale. Predictably, at Indian Creek the high soil moisture in 2011 destabilized slopes and accelerated the creep of the slope (Figure 12). Such events are not rare in this part of the world. Elevated pore pressures induced by ground water likely caused the Bighorn Mountains landslide in Wyoming ("The Gash," Figure 13) that made a splash in the media in October of 2015 (see responses at *Powell Tribune*, American Geophysical Union, or similar web sites).

While geologically "instantaneous" from the perspective of millions and billions of years of alleged earth history, they are gradual processes from a catastrophist or more episodic viewpoint. While very strongly influenced by water, many times they are not flood related. Many times, these processes are stochastic—not gradual or constant.

Effects from one type of process can be superimposed on effects from another (Figures 14 and 15). Each location needs to be researched on its own merits. When multiple processes have been involved—sometimes simultaneously—oversimplification can be a grievous temptation. This has long been a besetting sin among geologists.



Figure 10. Saint Ann's Cathedral, Great Falls, Montana.

Geotheorizing

Another besetting sin is a “top down” mindset. This may be said to have begun at least three hundred years ago with the growth of “geothory,” an attempt to concoct a “theory of everything” and then apply it to natural observation (Rudwick, 2005; Reed and Klevberg, 2011). This mindset is reminiscent of the “armchair” science of classical times, which was intended to be deduc-

tive, not the observational science that characterized the scientific revolution of Reformation Europe (Schaeffer, 1976). While pure induction has been properly debunked as the sole basis of the scientific method (Cleland, 2009), and many disputes whether there is such a thing as “scientific method,” it is actually an iterative process, as has been pointed out elsewhere (Klevberg, 1999). Unfortunately, this iterative process often breaks

down in practice (Miall, 2004). Of the three extreme errors—pure deduction, pure induction, and denial of a basic scientific method—the first is arguably most likely to lead one astray. In order for the iterative process to work, there must be a conscious effort to separate deductive predictions from inductive data analysis and only then to compare them (Figure 16).

Geotheorizing may amount to the development of a new “Flood Model,” or belief in “megasequences,” or just belief in the traditional use of the geologic column (i.e., “geologic ages”). But any-time geologic data must be forced into a preconceived natural history paradigm that dictates how the data *must* appear, there is the risk of greatly increasing the probability of error and missing or misinterpreting historical evidence (Ben-Menahem, 2009; MacDonald and MacDonald, 2011; Reed, 2013). An enthusiastic diluvialist or “Flood Model” proponent may easily see the lateral regional extent of strata and vast planation surfaces but miss evidence for smaller processes like local mass wasting and creep. A stratigrapher may note the pervasive strata but miss the associated geomorphology and local phenomena within and on top of them. A uniformitarian may attempt to explain regional strata and planation surfaces by extrapolating modern effects of rivers and mass wasting, with ludicrous results.

History and science require different methods (Adler, 1965; D'Amico, 2009; Reed and Klevberg, 2014a, 2014b) and necessarily lack certainty in their results (i.e., they are primarily inductive methods), despite three centuries of effort to conflate them and perpetrate the fable of “scientific certainty” (Reed and Williams, 2012). As an example, a “Flood Model” that assumes the biblical Deluge (or equally enormous megaflood) has the advantage of an available mechanism to explain the formation and preservation of the planation surface across the benches of the Judith Basin and likely



Figure 11 (*left*). The new bridge piers for the Ross Fork trestle are founded in freshly excavated bedrock of the Telegraph Creek Formation.

Figure 12 (*below*). Saturated soil conditions in 2011 initiated several small mass wasting events (slumps and slides) on the slopes of the Indian Creek Valley southeast of Danvers, Montana.





Figure 13. Three images of “The Gash,” which formed in 2015 in the Bighorn Mountains of Wyoming. These images were spread on the internet and published in the *Powell Tribune*.

the deposition of the Telegraph Creek Formation, but it does not facilitate explanation of current processes of lateral motion or creep. Even a good theory does not explain all of the data. While some geologic paradigm or philosophy of history is necessary to provide an interpretive framework, researchers who attempt a “bottom up,” “mixed question” way of thinking that acts iteratively with their “top down” natural history paradigms (Klevberg, 1999) will be less likely to miss important geologic features than those who are strictly theory driven. This “bottom up” mindset whereby each area is examined with openness to vari-

ous historical scenarios—Chamberlin’s “multiple working hypotheses” (Chamberlin, 1890)—is a superior approach in attempting to envision the possible history of Central Montana geology, or natural history speculation for any other region. A “mixed question” or “multiple working hypotheses” mindset may also encourage more effective observation of geologic features in the field.

Conclusions

Knowledge gained from observation of floods and geologic processes not related to floods has significance for geologic

paradigms that guide research and data interpretation. Particular points from the Central Montana projects featured in this series follow.

1. Ground water can influence strata high in montmorillinite and other smectite physils via lubrication, crystal entrapment, and pore pressure increases to mobilize movement on very low angle faults or creep planes.
2. Movement and mass wasting are often observed on the relatively steep sides of valleys. Persistence of these steep slopes indicates “youthful” ages relative to traditional old-earth thinking. The slopes provide an op-

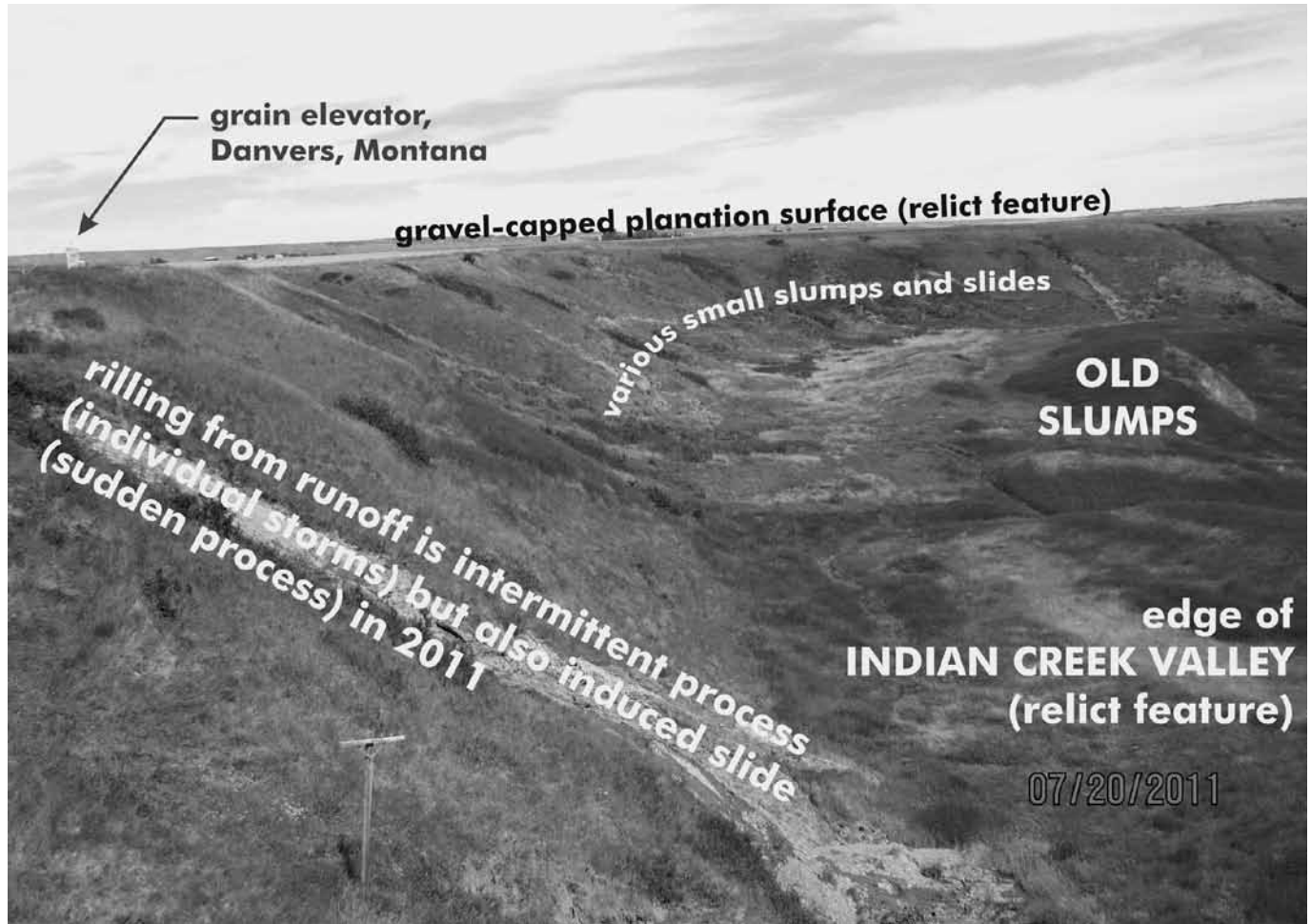


Figure 14. View toward Danvers from west-northwest end of Indian Creek viaduct. Danvers grain elevator helps provide scale of bench, a relict (“widowed”) feature disconnected from any ongoing process. Mass wasting events of various ages and scales are evident on west side of valley; these are episodic events. Rilling is an intermittent process, with the amount of erosion proportional to the amount of precipitation during storms; however, in 2011, a small landslide was induced at this location (episodic process).

portunity for large amounts of earth materials to lose potential energy through mass wasting processes.

3. Enthusiasm for particular natural history paradigms or geologic theories may cause researchers to see what they want to see, missing valuable geologic data. This “top down” paradigmatic approach can greatly hamper correct understanding.
4. While many features of the Earth’s crust indicate a catastrophic origin, not all do. Some of the processes

- observed in the current environment are adequate to explain some of the geologic effects. In general, these are much less extensive than the catastrophically formed features—often orders of magnitude (10^n) less. However, they must not be ignored. Each geologic locale must be investigated for itself, and researchers need to recognize the likelihood of polygenetic formations and features.
5. Historical geology is a “mixed question” that properly belongs in the

category of natural history. For progress in understanding the “mixed question” of earth history, deductive geologic paradigms must be tempered by considerable inductive field work and “multiple working hypotheses” in an iterative process (i.e., the scientific method). Geology as a science can contribute to efforts to address this “mixed question,” but results will always be tentative natural history speculations. A “multiple working hypotheses” perspective



Figure 15. View southwest from near west-northwest end of the Judith River Bridge. Note that slope instability induces processes unrelated to those that must have formed the bench (planation surface) and valley; in fact, the episodic mass wasting events are gradually destroying these relict features. Flooding intermittently reworks the flood plain surface without altering the basic geometry of the Judith Valley.

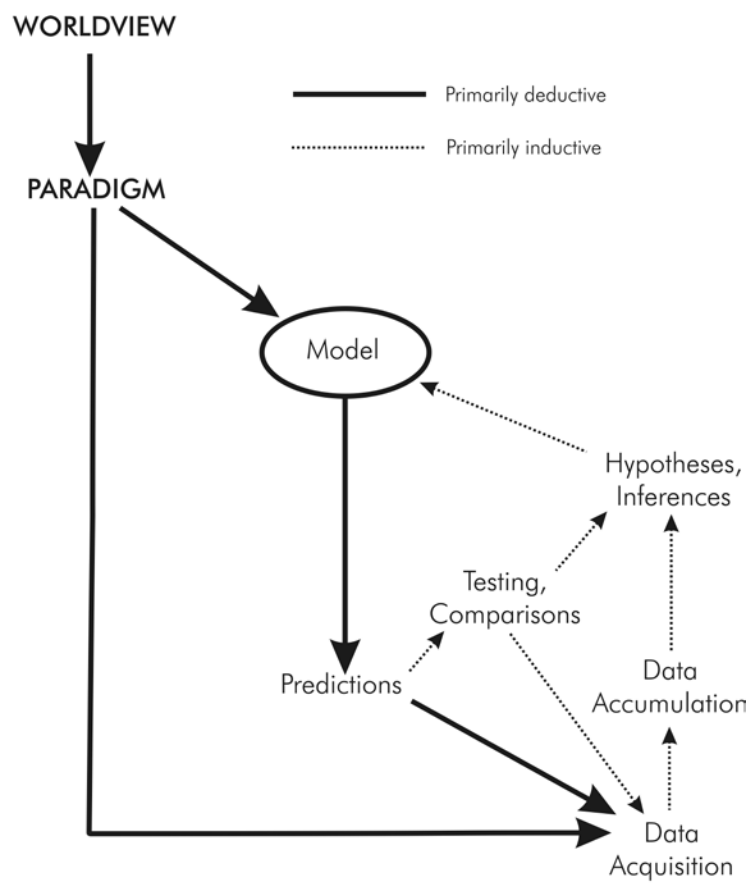


Figure 16 (left). The scientific method is a complex, iterative process that cannot be distilled into either deductive or inductive modes of logic. Application to forensic questions is similar. Figure modified from Klevberg (1999).

and bottom-up field research as opposed to top-down-only approaches can help maintain openness and a greater degree of objectivity, but in the end, historical speculation remains speculation.

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Cyclostratigraphy and Astrochronology

Part IV: Is the Pre-Pleistocene Sedimentary Record Defined by Orbitally-Forced Cycles?

Michael J. Oard and John K. Reed*

Abstract

Cyclostratigraphy is a popular method that promises much more precise dates than biostratigraphy or radioisotope dating. Originally, it was pioneered to date Pleistocene glacial/interglacial intervals, but its reach has been steadily extended back through the Cenozoic and into earlier eras using sedimentary cycles. Unfortunately, enthusiasm for its potential has blinded geologists to its problems. Six problems are addressed, revealing the influence of subjective factors not commonly noticed.

Introduction

One of the most popular new ideas in stratigraphy is that sedimentary rocks are imprinted by a series of discernible climatic (Milankovitch) cycles caused by slight but regular variations in orbital mechanics (Figure 1). Cyclostratigraphy is the method derived from this view and claims to provide accurate dating on the much more precise order— 10^4 to 10^5 years—a much finer scale than radiometric and biostratigraphic dating methods.

Reed and Oard (2015) described basics of the method and the Milanko-

vitch cycles that determine the slight variations in solar radiation that supposedly force climate over timescales as short as 20,000 years. Reed and Oard (2016) summarized the history of the mechanism, and Oard and Reed (2020) showed problems with the Milankovitch mechanism for proposed Pleistocene glacial/interglacial cycles (Figure 2). In this paper, we will explore how well it works in the deeper sedimentary record for pre-Pleistocene sediments.

In 2004, Miall and Miall offered an in-depth evaluation of cyclostratigraphy. Although much has been done since

then, their assessment included fundamental issues that cannot be masked by the proliferation of the application. Four of their criticisms are of interest:

1. There are not reliable tests of assumptions.
2. Natural variability in the record exceeds potential climate signatures.
3. There is a tendency among geologists to see cycles in virtually any data string.
4. Potential variations in orbital mechanics over deep time exist.

We examine these concerns, though not in their order.

Testing Assumptions of Orbitally-Forced Sedimentary Cycles

Miall and Miall (2004) claim that the assumptions of cyclostratigraphy cannot

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Figure 1. Miocene cyclic deposits, considered of Milankovitch origin, from the Tabernas basin of southern Spain (Verisimilus, Wikipedia commons CC-BY-3.0). Prominent beds are approximately 0.5 m thick.

be reliably tested (they cannot be tested in any scientific sense, since they are historical hypotheses). They noted that

cyclostratigraphy depends on “a hierarchy of five theoretical assumptions”:

1. A continuous section or one in

which discontinuities are noted and explained.

2. A constant sedimentation rate.
3. A certainty that orbital frequencies can be accurately projected into the geological past.
4. Confidence that sedimentary thickness can be converted to time.
5. Variability caused by facies and hiatuses can be managed by pattern-matching techniques.

In addition to these, several other assumptions hold; some made clearer by the biblical worldview. Cyclostratigraphy requires that the rock record can be converted to time in a globally synchronous manner (Reed, 2008a, 2008b, 2008c, 2008d). This requires very accurate dates for the sediments and assumes these dates reflect history. This is another point at which uniformitarianism and Flood geology diverge into drastically different conclusions. In a one-year flood, trying to use cycles in sediments as dating tools seems much less useful than trying to estimate current velocity or water depth.

Another uniformitarian assumption, that solar radiation changes associated

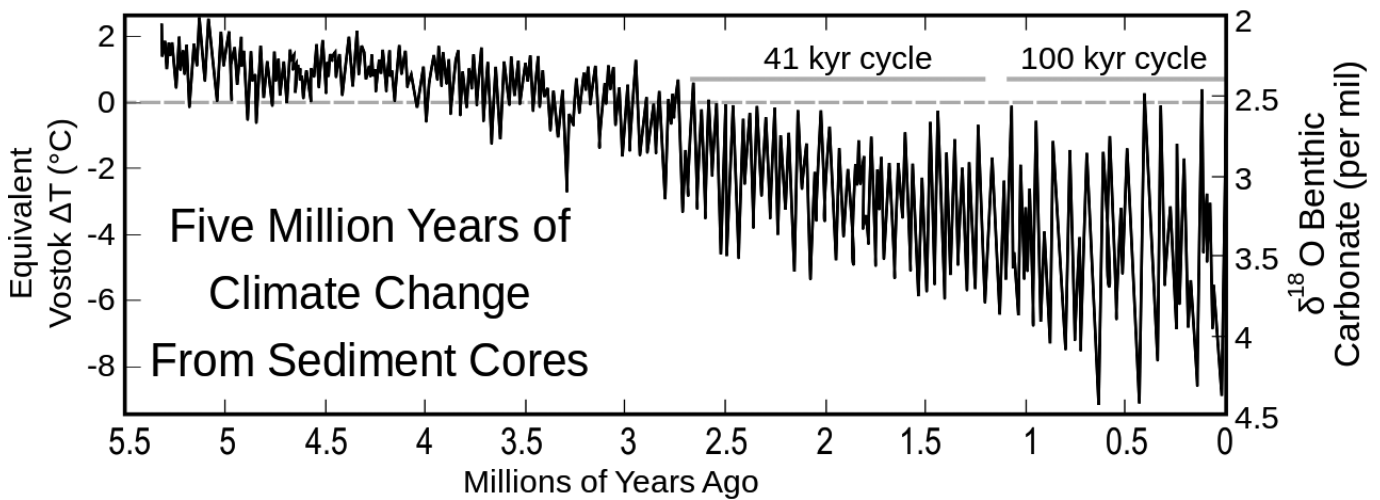


Figure 2. Reconstruction of the past 5 million years of climate history, based on oxygen isotope ratio of benthonic foraminifera (serving as a proxy for the total global mass of glacial ice sheets) and supposed changes in temperature at Vostok, Antarctica (Robert A. Rohde, Wikipedia commons CC-BY-SA-3.0). The oscillations since 2.6 Ma are believed due to the 41 kyr tilt cycle and the 100 kyr eccentricity cycle. The pre-Pleistocene cycles older than 2.6 Ma are now also assumed caused by the Milankovitch mechanism.

with Milankovitch cycles are a dominant feature of sedimentary rocks, cannot possibly be true within a diluvial framework. The supposition that climate is the dominant driver only works, in theory, in the idealized uniformitarian world of low-energy, gradualist processes. Even today, we see that “rare events,” (Dott, 1983) like storms and tsunamis, leave the largest mark on sedimentation and geomorphology.

Then there is the human factor. Confidence in human reason (i.e., the ability to objectively assess evidence and certainty in both scientific and historical studies) is crucial to understanding the past in either framework. But only one worldview justifies those assumptions—the biblical worldview (Reed and Klevberg, 2015). Cyclostratigraphy assumes that subjective factors, such as the bandwagon effect, are minimized. Miall and Miall (2004) noted the problems with subjectivity, tracing the bandwagon effect in uniformitarian’s increasing confidence in cyclostratigraphic analyses and conclusions over recent decades.

Problems in Cyclostratigraphy

These assumptions and criticisms by secular authors shed light on numerous problems with cyclostratigraphic dating of the pre-Pleistocene rock record (Oard,

1997a). Table 1 lists six of these problems. Most of these were previously pointed out by Miall and Miall (2004) above.

Problem 1. A Discernable, Accurate Astronomical Record through Deep Time

Uniformitarian scientists assume that the obliquity, precessional, and eccentricity Milankovitch cycles deduced for the past million years or so can be extrapolated far back in time (even older than the 66 Ma of the Cenozoic). However, Lasker et al. (2004, 2011a, 2011b) have shown that the gravitational cause of the Milankovitch cycles is chaotic, and so the cycles could have changed frequencies in the past. Since the two eccentricity cycles are commonly used to date pre-Pleistocene sediments, Lasker et al. (2011b, p. 1) stated, “As a result [of the unpredictable behavior of the asteroids Ceres and Vesta after 400,000 years], it will never be possible to recover the precise evolution of the Earth’s eccentricity beyond 60 Myr.” That is why, at present, geologists are cautious in extending cyclostratigraphy beyond the Cenozoic, but we predict that future studies will return the desired answers and push the dating method as far back as is needed.

The same can probably be said for the tilt and precession cycles, since these too depend upon changing solar system orbital geometry that is chaotic. The floating Milankovitch chronologies beyond the Cenozoic are disconnected from absolute time but are anchored to “independent” geochronometers (e.g., radioisotope-dated horizons, magnetic reversals, or biozone boundaries). Secular scientists have an approximate time for these cycles, but they still must assume that they were caused by the Milankovitch mechanism.

The highly mathematical models of Lasker et al. (2004, 2011a, 2011b) need precise orbital geometry extrapolated into the past. We wonder whether such extrapolations, even into the early Cenozoic, are that accurate if two asteroids in the asteroid belt can perturb the Earth’s eccentricity cycle. Hinnov and Hilgen (2012) provide a status report of cyclostratigraphy and astrochronology in relation to the Geologic Time Scale. Needless to say, none of this applies to sedimentation in the Flood model, which was rapid.

Problem 2. A Perpetual Milankovitch Climate Signal?

Milankovitch cycles produce only slight seasonal and hemispheric changes in solar radiation, insufficient for glacial/interglacial oscillations (Oard and Reed, 2020). Yet scientists persist in attributing both Pleistocene and pre-Pleistocene cycles to this weak mechanism. But if the Milankovitch signal is tied to a glaciation, how would it manifest in strata lacking glacial signatures, such as pre-Pleistocene sediments? Pre-Pleistocene glacial-related strata are currently restricted to the late Paleozoic, the late Ordovician, and the mid to late Precambrian (Oard, 1997b). If the Milankovitch cycles extend back through deep time, and operate in a predictable, uniform manner, it is fair to ask, “Where are the innumerable ice ages?”

Table 1. The main problems with pre-Pleistocene cyclostratigraphy.

| |
|---|
| 1. Knowing an accurate astronomical record through deep time |
| 2. Knowing how Milankovitch cycles produce a climate response |
| 3. Knowing accurate dates for sedimentary rocks to date cycles |
| 4. Knowing past sedimentation rates |
| 5. Accounting for natural variability |
| 6. Eliminating subjectivity and bias, especially the bandwagon effect |

If few are evident, it must follow that the Milankovitch variations cannot bear the weight of cyclostratigraphy. Only if these faint signals can trigger other climate signals detectable in sedimentary rocks in all climates, times, and depositional environments can the method be reliable. Though cautious early on, many geologists (i.e., Brack et al., 1996) today believe that such a signature is present and available for high-resolution dating in rocks extending back through the Phanerozoic (Hilgen et al., 2015; Hinnov and Hilgen, 2012).

Reed and Oard (2016) noted that cycles are detected in oxygen and carbon isotopes, clay types and abundances, lithofacies, microfossil assemblages, and even color. For example, cycles in Triassic carbonates in Austria are thought to represent eustatic (sea level) changes caused by Milankovitch cycles (Cozzi et al., 2005). Although the authors are not clear how the climate change affected sea level, they presume that oscillations

between “deep” and “shallow” water were recorded in features within the limestone. Many more assumptions go into these interpretations. Researchers are short on mechanisms connecting the solar insolation changes with sedimentation cycles:

Processes of sedimentation clearly depend on many more variables than insolation alone, and variations in insolation must be propagated through the complexities of the system before they can be encoded in the sediment. The mechanisms for this are not yet clear and they may be many and various. (de Boer and Smith, 1994, p. 6)

Problem 3. Knowing Accurate Dates in Sedimentary Rocks to Date Cycles

The sedimentary sequence must have accurate dates in order to discern any cycles, but other dating methods are

generally about two orders of magnitude less precise (except for paleomagnetism, which requires calibration to radiometric dates). Smith et al. (2015, p. 7) stated:

As Hilgen et al. (2014) point out, only the availability of sufficiently precise numerical dating of sediments could ever finally provide independent support for an orbital link with cyclic sedimentation.

Secular scientists must assume all their various dating methods are accurate. Therefore, the Milankovitch cycles are not really an independent dating method but depend upon these other dating methods, an example of confirmation bias. Milankovitch cycles purport to provide a much finer subdivision of dates between the “tie points” provided by the other dating methods. The advantage is more precise dating. But as seen in Figure 3, the challenge of interpolating between tie point dates is severe. For instance, if biostratigraphy

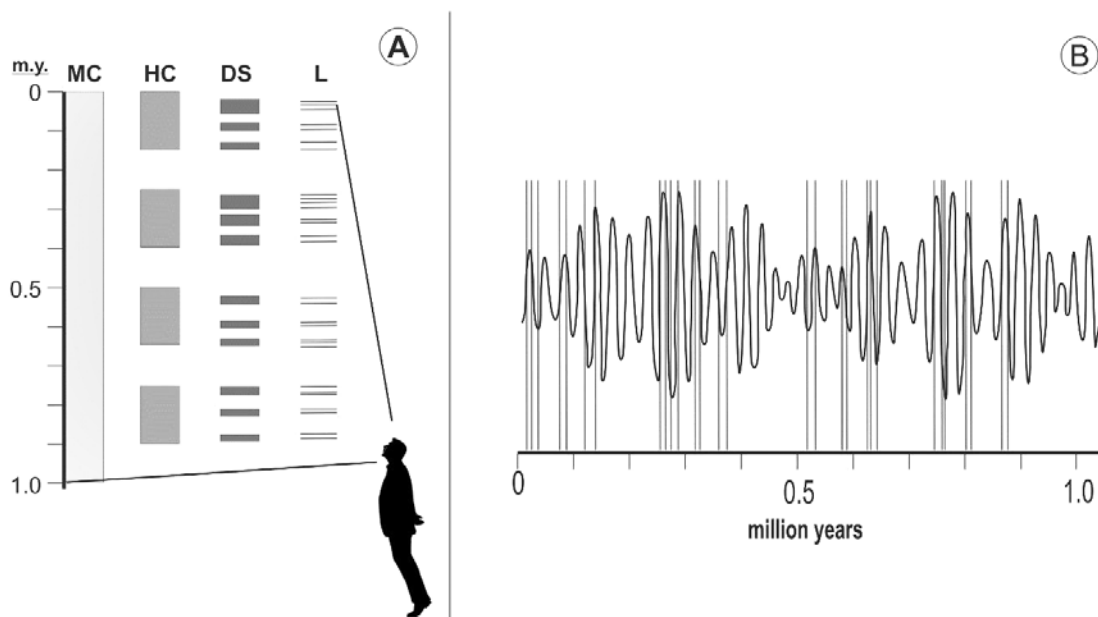


Figure 3. Miall (2015) noted that stratigraphic scale and human perception masks the extent of the missing record. (A) When the rock record is presented at a gross scale, such as a million-year range (MC), with only large regional unconformities shown, it overstates the record. Finer depictions, such as a hundred thousand-year cycle (HC), a depositional system scale (DS), or a lithesome scale (L) shows the continual removal of the geologic record. (B) This clearly demonstrates the inability to adequately calibrate actual sediment (the lines) relative to missing section (white space between the lines) to Milankovitch cycles.

provided a date of 50 Ma for the bottom of a sequence, and a radiometric date 10 meters up the same sequence provided a date of 45 Ma, then we would expect 5 million years-worth of cycles. But do small unconformities distort the correlation of cycles? How do we know which cycle to choose: the 21,000-year precession signal, the 41,000-year tilt signal, the 100,000-year eccentricity signal, or the 400,000-year eccentricity cycle? Miall and Miall (2004, p. 39, emphasis added) noted:

We suggest that attempts to develop a time scale with an accuracy and precision in the 10⁴-year range by calibrating it against conventional chronostratigraphic dates up to two orders of magnitude less precise presents a *fundamentally flawed methodology*.

When speaking of chronostratigraphy and geochronology, Gradstein (2004) also claimed that geochronologic (absolute) ages were matters of “discovery” and “estimation.” This is the opposite of common sense. We would expect that the chronostratigraphic position of strata would be “discovered” through field work, and that dates would simply be measurements (c.f., Ferrusquía-Villafranca et al., 2009). It sounds like the retreat from chronostratigraphy towards geochronology is the natural progression of the overall trend away from empirical stratigraphy (Reed et al., 2006).

Hilgen (1991; cp. Hilgen et al., 2015) and Shackleton et al. (1990) independently derived orbital cycle chronologies based on matching sedimentary cycles and oxygen isotope curves to the extrapolated history of Milankovitch insolation changes. Their results were at odds with widely accepted potassium-argon dates, but not rejected. Instead, “improved” radiometric dates were introduced to confirm the validity of the astronomical time scale approach (Weeden, 2003, p. 3). In other words, the conflict between “data” was resolved

in favor of the preferred “new” approach and then “validated” by revised dates once the answer was “known.” Though presented as scientific progress, it might also be seen as an example of manipulating measurements to get a desired result (Hebert, 2019). This is why the bandwagon effect is a real concern for cyclostratigraphy.

Another example of this type of manipulation was seen in one of the classical studies involving the Neogene Monte dei Corvi succession in Italy: “The discrepancy leads to an adjustment of the dating of the two ash layers—the independent data upon which the calibration is based...” (Bailey, 2009, p. 347). A comment was added: “The ‘astronomical’ time calibration thus supersedes the radiometric data on the basis of two key assumptions, namely that the calibrated section was continuously accumulated and that the matching of the smoothed carbonate content data with the theoretical orbital cycles is unambiguous...”

In addition to radiometric and biostratigraphic dating, geologists use the standard polarity magnetic timescale to calibrate cycles, but this dating method simply adds uncertainty. Murphy and Salvador (1999, p. 271) noted that magnetic reversals “have relatively little individuality, one reversal looks like another...” Comparisons and correlations between Milankovitch cycles and paleomagnetic reversals thus become subjective; both suffer from the same basic problem—determining a unique point from strings of repeating data. Torrens (2002, p. 257) referred to what he called the “bar-code effect” of dealing with “basically repetitious, often binary” data of orbital cycles and magnetic reversals:

The problem is that, if one barline is missed or remained unread, the bar-code becomes that, not of the next object, but that of a quite different object. The proximity of the next object, becomes no proximity at all.

Problem 4. Need to Know Past Sedimentation Rates

Correlation of imprinted Milankovitch patterns assumes that the sedimentation rate is known and constant. Both assumptions are commonly made (Miall and Miall, 2004), but are incorrect (Bailey and Smith, 2008). Any undetected hiatus or change in sedimentation rate affects the cyclostratigraphic result. Modern depositional environments demonstrate that slow and steady sedimentation is unrealistic.

A) Ubiquitous Gaps Preclude Accurate Rate Estimates

Major unconformities erase millions to hundreds of millions of years of supposed time from the rock record (Reed and Oard, 2018). These have been identified in the field and geologists assemble the puzzle of remaining parts stratigraphically. But the advent of neocatastrophism in the late 20th century highlighted an aspect of the record hidden for long decades by Lyellian gradualism—episodic sedimentation dramatically reduces the “history” actually contained in the rocks. Ager (1973) noted that the record was composed mostly of gaps. This created a cognitive dissonance in geologists; they could not disagree with Ager’s conclusion, but had to act as if it was not true.

To further complicate matters, Bailey and Smith (2008, 2010) developed a method for quantitatively assessing the presence of hiatuses of all scales using gamma ray logs. Gamma ray logging is a method of measuring naturally occurring gamma radiation to determine the type of rock or sediment in a borehole or drill hole. Different types of rock emit different amounts and different spectra of natural gamma radiation. Their Layer Thickness Inventory has been applied to thousands of logs and has shown that discontinuities are the rule rather than the exception. Reed (2016) concluded that their work was a powerful argument against traditional stratigraphy. Miall

(2015) admitted that breaks occur at all scales and are common (Figure 3), but has attempted to save uniformitarian history by linking physical scale to temporal scale. Thus, large regional strata adequately represent deep time because they are composed of a representative sample of small, more rapidly deposited components (Reed, 2018).

Miall (2014) demonstrated the extent of missing time in the Mesaverde Group, Book Cliffs, Utah, USA. He showed that the sedimentary rocks seen in the field represent only a *fraction* of the total time ascribed to the Mesaverde Group. Even worse, he showed that there is very little field evidence for this missing time. Then he noted that the same kind of obscure *gaps* are *typical of strata worldwide* and that sedimentation provides a record of only 10% of the time, while 90% is not represented by any strata at all. It is worth noting at this point that Miall is committed to uniformitarianism and its derivative history (Miall, 2015).

Missing strata with little evidence that it is missing is a fatal problem, *given the constraints of their worldview*. Christians have often erred in allowing the presuppositions of Christianity to be appropriated by believers in naturalism: nature is all there is. Uniformity must hold true, and be as close to static as possible, if our present scientific reality is to be extrapolated by billions of years into the past (Reed, 2001). If 90% (using Miall's estimate) of the tangible historical record is absent, then what level of confidence do the remaining scraps yield? What if it is really 99%? Secularists have been claiming for more than 200 years to be objective rational empiricists while saying Christians cling to faith contrary to reason. But who is walking by faith and who by sight? Although some geologists would disagree, Miall (2015, p. 13) points out that Bailey and Smith's (2010) work answers that question: "The notion of continuous deposition, on which the historicity of

the record depends, has no theoretical or evidential basis." At the edge of the precipice, however, Miall (2015, p.13) acknowledges the implications: "Is the stratigraphic record fundamentally unrepresentative of the geological past? These conclusions would appear to invalidate virtually the whole of the last two centuries of stratigraphic progress."

Though Miall goes on to affirm uniformitarian history, he somehow does so conforming to the conclusion of Kravitz (2013) that pragmatically attractive, natural history exists largely in the minds of geologists.

B) And Neocatastrophism Makes It Worse

The fad of neocatastrophism rids geologists of the albatross of Lyell's gradualism (Reed and Oard, 2017), but with a belatedly unintended consequence of pointing to greater uncertainty in the rock and fossil records. It is bad enough if the rock record is composed mostly of gaps; it is infinitely worse if the bits and pieces that remain were deposited rapidly. Two geologists recently noted:

One [problem] is a misconception of the amount of geologic time represented by the rock record. Conodont assemblages embodied in the "Standard Zonation" may be recognized within lag deposits, which produce phantom zones that expand the apparent time represented by a rock interval and represent clastic provenance and hydraulic sorting rather than time. (Macke and Nichols, 2007, p. 265, brackets ours)

In other words, even when rocks are present, the standard uniformitarian explanation does not account for the time. For example, Reed (2000) showed that the ~20 million years represented by the volcanic flows of the Midcontinent Rift System vastly overstated the actual time of emplacement that was in days to weeks. The public thinks the rock record is a jigsaw puzzle, with a few pieces missing. In reality, *most* of the pieces are

gone. The vast majority of rocks claimed to have been deposited across deep time do not exist. You wouldn't suspect the problem from most published material. Uniformitarian geologists are quick to admit that there are no cases anywhere of continuous deposition over just one stratigraphic stage, usually a few million years, much less the 4.6 billion years of deep time, but they continue to believe that it does not affect their historical narrative (Miall, 2016).

Discontinuities in the rocks do not present similar problems for Christians for two reasons: (1) the rocks are a much more complete record of the Flood, with many "gaps" representing hydraulic changes, not time, and (2) Christians are not positivists (assuming nature is all that exists); there is an external framework of history in the Bible that guides forensic uncertainty.

Problem 5. What about Natural Variability?

The commitment to uniformitarianism creates a blind spot. Even geologists who are neocatastrophists tend to default to the gradualist paradigm until evidence proves otherwise. As with varves or ice layers, they simplistically assume that the target sediments were deposited slowly, uniformly, and in response to regular climatic variables. They assume static conditions for thousands to millions or billions of years, even when observations of modern depositional conditions show otherwise. Remove those assumptions and the whole theory crumbles, for both ice layers and varves (Oard, 2005, 2009).

Catastrophic sedimentation renders cyclostratigraphy invalid. Sedimentary rock is the product of: (1) a source of sediment particles, (2) a mode of transport, (3) deposition influenced by local tectonics, and (4) its likelihood of being preserved. For cyclostratigraphy to work, all four must be ideally *uniform*. That's hard to imagine. For example, diagenesis

alters carbonate sequences (Neuendorf et al., 2005) and can distort any climate signal (Westphal et al., 2004). A large submarine slump would generate turbidites that could hypothetically show a regular cycle of interbedded lithologies. Yet deposition was instantaneous. Could a plot of the various chemical ratios in such a deposit be calibrated to astronomical cycles? Smith et al. (2015, p. 6) state:

The question is whether orbital forcing leaves an imprint on the record that can be distinguished from that of the many non-cyclical processes in play along the routing system. Much current research is focused on the time-lags and hence buffering that the routing system interposes between the site of sediment production and the sink areas of long-term preservation, suggesting that these effects can be more than enough to damp any cyclic forcing of sediment supply.... The contrary idea [to the recording of Milankovitch cycles] are: (1) that the translation of variable insolation [caused by Milankovitch cycles] into environmental change, and thence into sedimentary processes, is non-linear; and (2) that due to their non-linear operations and the hiatus-riddled character of their outputs, sedimentary systems provide poor recording media for quasi-periodic insolation variations.

It should go without saying that if the Flood really happened that the entire method of cyclostratigraphy, as well as radiometric and biostratigraphic dating, is irrelevant to history. For example, the early and late stages of the Flood were probably marked by dramatic volcanism and tectonic activity. The local increases of ions and temperature in seawater would have swamped any solar signal, and combined with particles in the atmosphere, would have been responsible for unpredictable variations in solar radiation far in excess of any

orbital variation, even if the variations in the sediments were not caused by hydraulic factors.

Problem 6. The Human Factor (Influence of Presuppositions)

Of course, the fundamental problem of secular natural history is still there. All the *scientific* measurements in the world are made in the present and the conclusions are only as historically reliable as the *unscientific* assumptions used to interpret the measurements. Subjectivity and uncertainty are inherently part of such studies. Miall and Miall (2004) provide an extended discussion of this problem, noting that the method has become a “black box” and has not been subjected to the scientific scrutiny needed to validate its assumptions and methods. In doing so, they provide a good summary of the early history of the method and cite key early references. Furthermore, there is a tendency for geologists to “see” cycles that do not exist:

Pollitt et al. (2014) investigate a different aspect of layering in stratigraphy, in this case the geoscientist’s tendency to observe cyclic patterns in layering relationships where none necessarily exists, a tendency classically investigated by Zeller (1964). (Smith et al., 2015, p. 5)

Though accomplished decades before the rise of cyclostratigraphy, Zeller’s (1964) study of correlation seems applicable. Different geologists, given a variety of logged sections to correlate, came up with divergent interpretations. These were not real cycles. When they complained that the author had “fooled” them, Zeller (1964) noted that nature does the same. Her warning against inherent uncertainties in natural patterns, subjective confirmation bias, and overconfidence in interpretation should be heeded by practitioners of cyclostratigraphy.

These problems pale beside the logical shortcomings of the method, particu-

larly the circular reasoning inherent in its assumptions and results. Speaking of evidence of orbital cycles in sedimentary rocks, one geologist noted:

Classically, however, this evidence derives from *assuming* model (a) or model (b) [his two models of cyclicity in sedimentary rocks used by proponents of cyclostratigraphy] and showing that these assumptions will lead, by cycle counting or “tuning,” to one, or more of the expected outcomes in terms of orbital periodicities. This tendency to circular reasoning is endemic in cyclostratigraphic analysis and is acknowledged by its proponents.... (Bailey, 2009, pp. 347–348, emphasis in original, brackets ours)

Miall and Miall (2004, p. 42) reinforce this deduction:

In research where the science is complex, with results dependent on data of varying quality from many sources, or in cases where the technology is not fully developed, the power of the preconceived idea may overwhelm “objectivity,” and the impact of social influences become more clearly evident. The impact of social influence, however, cannot be separated from the scientific practices it generates and is ultimately influenced by.

Summary

Cyclostratigraphy is a growing trend in geology and will probably continue to be so for some time. However, numerous fundamental problems will continue to haunt it, and eventually should lead to its downfall. Its basis in astrochronology requires a rigid gradualism contrary to the accounts of the Creation and the Flood, and its application in sediments appears to involve a high degree of wishful thinking and cognitive dissonance. For these reasons, creationists should be very wary of using its conclusions.

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The Johnnie Oolite: A Remarkable Early Flood Deposit in the Death Valley Region, California, USA

Cornelius Van Wingerden

Abstract

The Johnnie Oolite bed is a significant and regionally widespread carbonate deposit exposed in the Death Valley region of the central Southern Great Basin of California, USA. Most modern oolitic deposits occur in warm waters off tropical and temperate regions such as the Bahama Islands. These are well studied and understood. Oolite deposits found in the geologic record leave some investigators perplexed. In ancient environments, mode of deposition, association with confining sediments, chemistry of sea water and the range, size, and development of ooid formation differ from modern exposures.

The Johnnie Oolite bed, averaging 6 feet thick, is a carbonate grainstone composed mostly of ooids, peloids, and lithic fragments was deposited in a high energy environment. Several field exposures of the Johnnie Oolite were observed and investigated. It is stratigraphically bounded above and below by shale deposits. The ooids in the Johnnie Oolite bed are cross bedded and normal to inversely graded. In places, clasts of carbonate mud oriented edgewise are floating within the oolite bedding. In the Nopah Range, the upper middle oolite bed is disrupted and contains rip-up clasts, fluid escape structures, and an erosional bedding plane. These sedimentary structures, their relationship to the enclosing shale beds and the thin section analysis indicate rapid deposition by strong currents in a deeper marine environment, consistent with the earliest stages of the Noachian Flood.

Johnnie Oolite grainstone is interpreted as a mass flow with physical properties of strength and competence and super saturated with CaCO_3 . The ooids and peloids likely formed in transit after the breakup of the initial Fountains and the deposits of the Kingston Peak Fm and Noonday Dolomite. The Kingston Peak Fm is considered the initial Flood deposit in the study area.

Introduction

The Johnnie Oolite carbonate bed (JOB) is a grayish to pale yellow-orange colored stratigraphic marker bed averaging 6 feet thick and located in the Death Valley and Mojave Desert area of the central region of the southern Great Basin, southwestern United States (Figure 1). This marker bed stands out like a ribbon in many distant mountain views and helped early geologists map the regional geology. The JOB is constrained within the upper Rainstorm Member of the Johnnie Formation, a heterogeneous formation of carbonate, quartzite, siltstone, shale, and minor conglomerate. It thickens westward from 0 feet in the eastern region up to 5000 feet and is “extensively exposed in the Death Valley region and Kingston Range area, CA” (Stewart, 1970). The JOB also outcrops 85 miles to the north at the Nevada Test Site and 65 miles south within the Providence Mountains outside of the study area (Figure 2) and is regionally extensive up to 10,000 square miles in areal extent. A similar oolite bed is found in Sonora, Mexico so the extent could be greater if the two oolite beds correlate (Corsetti et al., 2002). For comparison the areal extent of the state of Maryland is 9775 sq. miles.

According to Corsetti et al. (2002), “The Johnnie Oolite is the most awesome oolite bed in the world.” However, many questions remain unanswered. For example, how were the ooids formed during rapid deposition of sediment during Noah’s Flood? There are many carbonate beds throughout the Johnnie Formation but few if any beds contain the abundance of ooids observed in the JOB. Some questions for consideration: did the ooids form in a shallow wave induced environment? Did a selective chemical/physical environment contribute to their formation? Did they grow in situ after deposition? Did ooids form earlier and only transport with carbonate bedding?



Figure 1. The Johnnie Oolite carbonate bed at the Gunsight mine in the southern Nopah Range, Mojave Desert. The pale-yellow colored Johnnie Oolite bed outcrops right of the mine workings and the razor back continues up the slope left of middle background at sky line. The bed stands out like a ribbon in the Death Valley region, which helped pioneer geologists mapping the area. The Johnnie Oolite bed extends an aerial coverage of 10,000 sq. miles or more in the Death Valley/Mojave Desert region. This is comparable to the aerial extent of the state of Maryland.

Geologic Setting of the Death Valley and Mojave Desert Region

The western edge of the North American continent (WNA) has undergone a diverse geologic history that produced complex structural and geomorphic landforms and provenances. In this paper, the writer accepts the Catastrophic Plate Tectonic (CPT) model of Austin et al. (1994) to explain the occurrence of tectonic upheaval and rapid sedimentation of the strata observed in the Death Valley and Mojave Desert region (DV/MD). The Johnnie Formation, specifically the upper Rainstorm Member which contains the JOB, is the focus of this paper. A brief discussion of the occurrence of underlying strata and the nature of deposition will help us under-

stand the catastrophic nature of debris flow deposition and erosion found in the DV/MD area during the early Genesis Flood time. Refer to Figure 3 for a simplified stratigraphic column depicting the strata that are discussed next.

In the CPT model, some of the “breakup of the fountains” (Gen 7:11) are thought to have occurred along the edges of pre-Flood continental oceanic margins, coincident with zones of oceanic sea floor subduction. In the DV/MD region, Sigler and Wingerden (1998) report that initial Flood deposits are contained within the Kingston Peak Formation (KPF). As the WNA continental edge was likely down-warped at the start of the Flood (Baumgardner, 2006), the underlying pre-Flood and basement

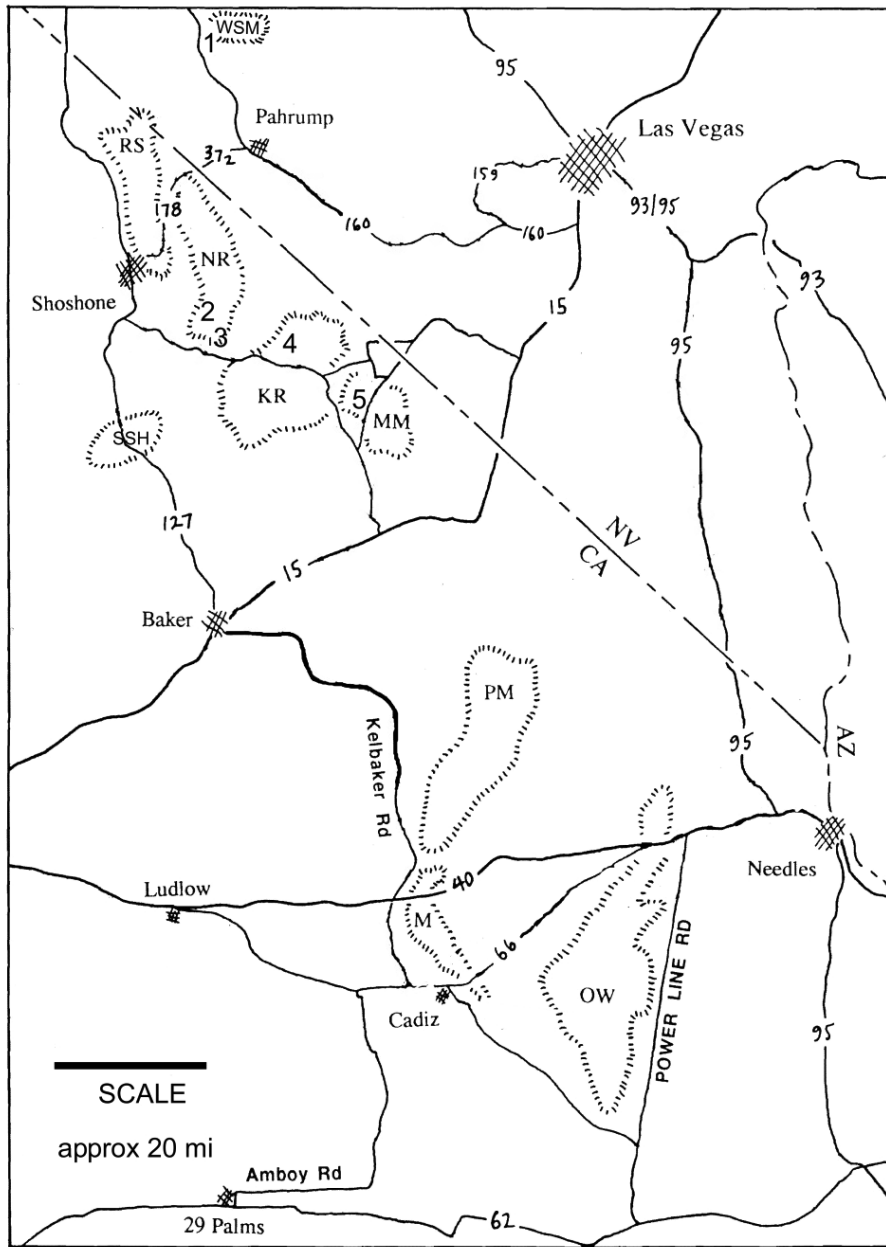


Figure 2. Location map of areas where outcrops 1 thru 5 were visited and samples collected. Mountain ranges: KR-Kingston Range; M- Marble Mnts; MM-Mesquite Mnts; NR-Nopah Range; OW-Old Woman Mnts; PM-Providence Mnts; RS-Resting Spring Range; SSH-Salt Spring Hills; WSM-Western Spring Mnts. Modified from Geological Excursions in Southern California and Mexico. Walawender and Hanan, editors, page 147.

terrane was unroofed and deposited in the KPF as debris flowed. Mega clasts and blocks of rock—some larger than the average house—were observed

and mapped (Sigler and Wingerden, 1998). The underlying metamorphic basement complex, the Crystal Spring Fm, and the Beck Spring Fm are also

considered pre-Flood (Austin and Wise, 1994). The Noonday Dolomite overlies the KPF, and according to Wise (2001), is a debris flow. Wise (2001) states that “on every lithology, the basal Noonday locally contains clasts of the underlying lithology.” Locally in the DV/MD area, the Noonday debris flow has eroded all the lower strata and rests on basement. This created erosional relief of several thousands of feet, all possibly occurring within a few days or weeks early in the Flood. The Johnnie Formation rests conformably on the Noonday Dolomite in the DV/MD region. But towards the south, in the Providence Mountains (Figure 2), it is found resting unconformably on basement rock (Bahde et al., 1997).

From the field relationships of early Flood strata we can discern that sediments were deposited and eroded quite rapidly during the upheaval at the start of the Flood near the edge of WNA. Debris flows may have eroded earlier debris flow deposits and then were eroded themselves by sequential flows. Uplifted sections of pre-Flood and early Flood strata allow us to observe and study early Flood processes. Through all the upheaval and destruction, God opened an erosional window for us to understand what He declares in His Word.

Ooids and Oolite Deposits

Ooids are rounded to ellipsoidal carbonate grains 0.5 mm to 2.0 mm in diameter but can grow larger (Scholle and Ulmer-Scholle, 2003). *Ooid* refers to the individual grains and the term *oolite* refers to a rock containing ooids. The purely descriptive term ooid “fish egg” and oolite “egg stone” are derived from the ancient Greek. Descriptive terms should supersede genetic terms. A genetic term implies a preconceived process whereas many geological processes can render similar results. In this paper the terms *oolite* and *ooid* will be used interchangeably. Modern calcareous ooids as seen in Figure 4 are composed

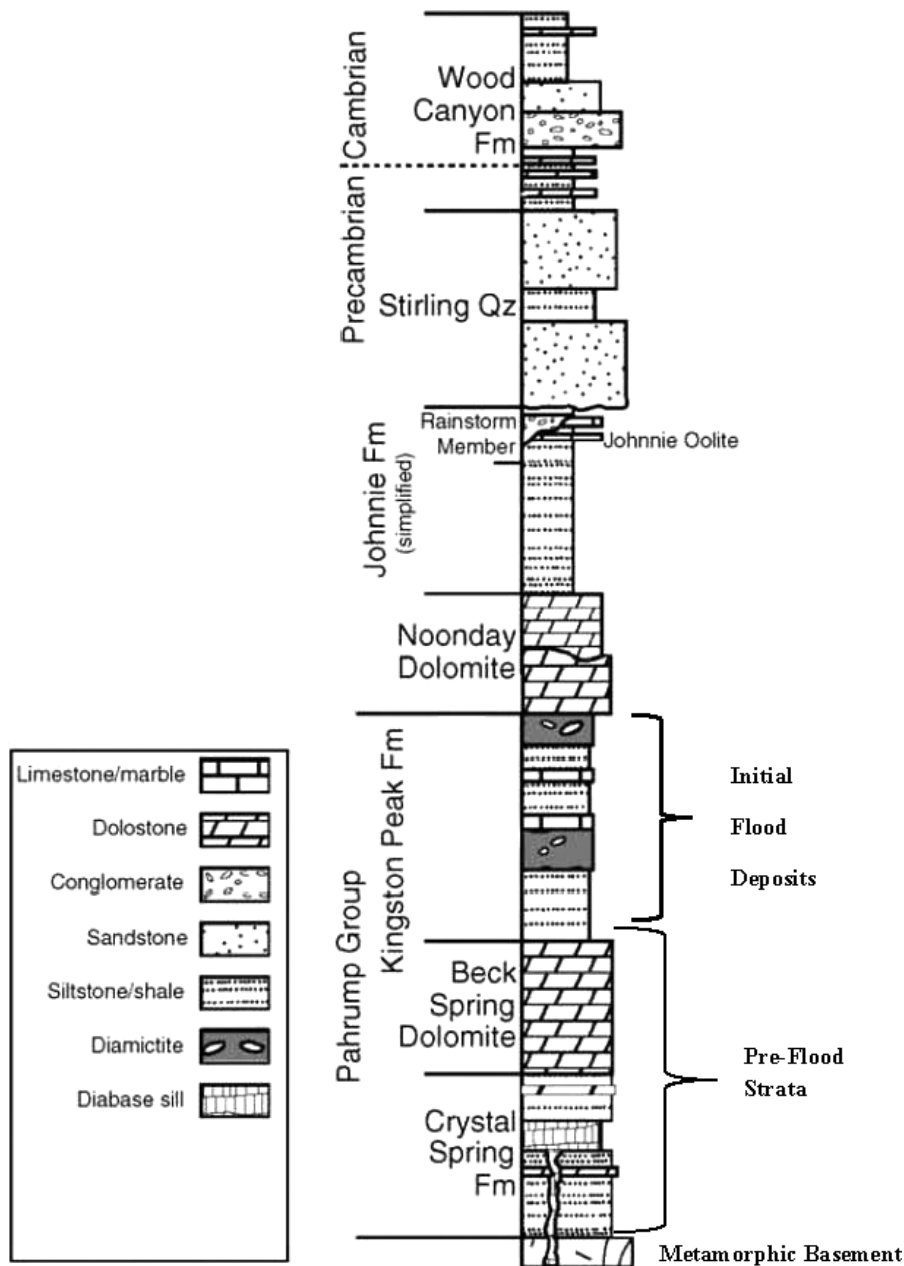


Figure 3. Simplified columnar section of strata in the study area. Modified from Clapham and Corsetti, Deep Valley incision in Neoproterozoic Johnnie Fm.

of aragonite or Mg-calcite coatings but may have ferruginous, siliceous, phosphatic, or other coatings (Scholle and Ulmer-Scholle, 2003).

Ooids require a suitable physiochemical environment for inorganic or microbial precipitation with repeated ro-

tation of grains in order for the coatings to form (Scholle and Ulmer-Scholle, 2003). Within a fluvial environment, chemical precipitation starts around a nucleus or seed agitated by water and supersaturated with carbonate, forming the rounded ooids. The seed could be organ-

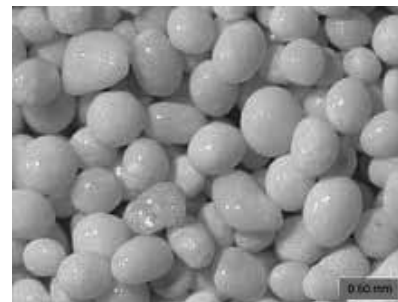


Figure 4. Modern calcareous ooids from a beach on Joulter's Cay in the Bahamas display their spherical shape and size. They are highly polished from vigorous wave action. Photo from Wikipedia free encyclopedia.

ic matter, shell fragment, fossil, or sand grain. A concentric growth structure or cortical layer grows around the seed with repeated chemical precipitation. There are two common types of ooid structures: radial and tangential. Most modern day oolites have concentric microstructure composed of tangentially arranged needles of acicular aragonite (Tucker, 1982). This type of microstructure forms a lateral banding around each cortical layer. The microstructure of radial ooids has their crystalline needles within each cortical layer jutting outward like the spokes of a bicycle wheel. Figure 5 displays the various microstructures of ooids. The internal structure of ooids is clearly seen in thin sections. Figure 6 shows the radial microstructure of ooids from the Jurassic Carmel Fm in Utah.

Modern oolites form in a variety of physiochemical environments ranging from shallow marine to lagoons, lakes, rivers, and caves (Thomas and Groves, 2002). As an example, an interesting and unique oolite deposit was found and collected in the Carlsbad Caverns of New Mexico in 1925 by Dr. Willis Lee. According to Hess (1929), the cave pearls, as Dr. Lee referred to them, formed in shallow pools, which collected water supersaturated with calcium carbonate from dripping stalactites; the splash pro-

vided agitation for the spherical grain to grow. Oolites are found in strata encompassing all of the geologic rock record.

The deposits of modern and ancient oolites may indicate the physical energy of the environment in which they are formed and infer the chemical composition of formation waters (Wilkinson and Landing, 1978). Li et al. (2015) present a summary concerning the value of ooids found in sediments:

Ooids are valuable proxies indicating paleoceanographical conditions, such as water energy levels, water depth, salinity, sedimentary settings, climate conditions, as well as sensitive aqueous chemical conditions.

Davies et al. (1978) state that most tangentially structured ooids form in vigorously agitated waters whereas the radial type develops in a less agitated environment. Also, most ancient oolite deposits consist of radial structure and recent deposits are tangential in structure. There are exceptions however; recent oolite deposits in the Great Salt Lake are composed of radial structure (McGuire, 2014). McGuire found that the radial structures formed in high energy environments displayed large clear radial crystals, whereas lower energy environments formed smaller radial crystals. In some instances, episodes of growth are destroyed by abrasion but continued precipitation continue to create additional cortical layers. Experimental results by Trower et al. (2017) suggest a dynamic equilibrium exists between the buildup and the erosion of the ooid until the grain reaches maximum size reflective of the environment in which it formed. Ooids in older deposits most likely will undergo physical and chemical change due to diagenesis—the change occurring after lithification.

Oversized or giant ooids occur throughout ancient rock strata and are puzzling to some researchers. For example, why are oversized ooids abundantly found in ancient oolitic deposits but are lacking in modern day oolitic deposits?

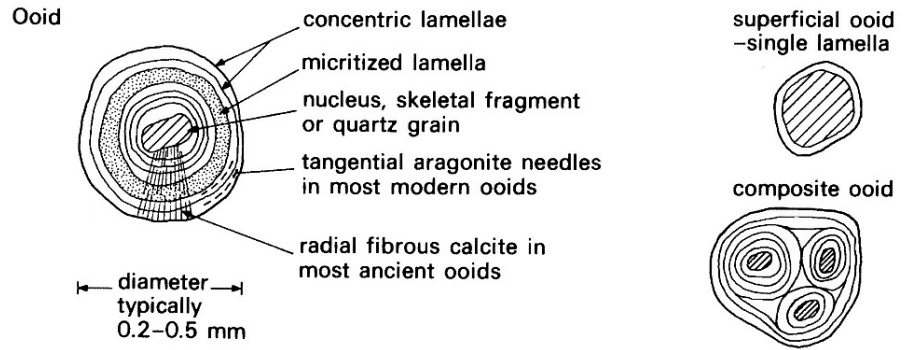


Figure 5. Sketches of the various micro crystalline arrangements in ooids. Modified from Tucker (1982).



Figure 6. Thin section of Ooids from Jurassic Carmel Fm in Utah. Note the radial concentric growth pattern and cortical layers. Photo from Wikipedia free encyclopedia.

Li et al. (2015) tabulated and summarized the occurrence of oversized ooids and found that they occur in the Late Archean through Late Jurassic along with their smaller counterparts. Additionally, oversized ooids are found in abundance and are wide spread in some carbonate rocks of Late Permian and Triassic. To explain this paradox, researchers

suggest increased ocean temperatures and carbonate saturation during “giant” ooid growth. Between the Permian and Triassic Systems a mass extinction event is claimed to have occurred on earth according to the evolutionary worldview. This episode is labeled the Permian-Triassic mass extinction (P-T). Evolutionists claim that this extinction

event caused the oceans and biosphere to be subjected to extreme chemical and physical conditions such as increased water temperature, calcium carbonate, and water alkalinity (Li et al., 2015). According to Li et al. (2015), the P-T

is not only a dramatic loss in biodiversity...but also coincided with the formation of abundant unusual sedimentary structures. Of these, ooids were wide spread in shallow marine carbonate settings during the Permian—Triassic transition and giant ooids occurred more frequently at this critical period.

It is not surprising that unusual sedimentary structures and deposits are found within Flood rocks. Due to the breakup of the “fountains of the great deep” (Gen. 7:11), colossal volumes of lava, water, and steam were released, “some with high mineral content and/or rare chemistries and high temperatures” (Morris, 2012). Extreme oceanic water chemistry and temperature changes were likely occurring during the Genesis Flood. This may help explain the extreme chemical conditions for ooid growth in the past geologic rock record.

The Johnnie Formation and Johnnie Oolite

Uniformitarian/evolutionary scientists advocate a very complicated and protracted history concerning the development of the western edge of North America (WNA). Ignoring pre-Rodinia time a billion or so years ago, and its supposed ancient landmasses, they believe that the history of WNA starts with the breakup of super continent Rodinia around 750 million years ago. Eventually the proto-WNA continent transitioned to a passive margin over tens of millions of years. According to this evolutionary model, the predominantly siliciclastic Johnnie Formation strata formed during final rifting and passive margin phase with concurrent subsidence of the WNA approximately 550 Ma (Stewart, 1972; Summa, 1993; Bahde et

al., 1997). A passive margin represents less tectonic, volcanic, and intrusive activity. However, it includes increased sedimentation from the interior craton coupled with transgressive marine deposits. This evolutionary model attempts to explain the deposition of Neoproterozoic through Cambrian strata found in the southwest Basin and Range and Death Valley region over a time frame of many millions of years. See Figure 3 for the sequence of the strata. However, the same rock data interpreted within a biblical worldview suggest otherwise.

The upper-most Johnnie Formation is called the Rainstorm Member and is considered the most widespread member within the formation (Stewart, 1970). The Rainstorm Member is further subdivided into three units. From bottom to top they are informally named the siltstone unit, the carbonate unit, and the siltstone-quartzite unit. The Johnnie Oolite bed (JOB)—the focus of this paper—occurs in the lower siltstone unit of the Rainstorm Member. The siltstone unit is composed of purple and greenish silty platy shales.

The JOB is a grayish to pale yellow-orange dolomitic grainstone primarily composed of ooids ranging in diameter from 0.125mm to 1.0mm and larger. The matrix is very fine dolomitic cement containing lithic fragments of quartz, feldspars and mafic minerals. At all outcrops the JOB is constrained by upper and lower silty shale beds and is laterally and vertically uniform in thickness. Observations in the field by the author of this paper support the work previously reported by Wright and Troxel (1966).

Methods

Five outcrops of the JOB were visited at the following locations: the western Spring Mountains, the southern Nopah Range (Gunsight mine and Noonday mine areas), the western Kingston Range, and the Mesquite Mountains (Figure 2). Field observations of the

JOB attempted to record: sedimentary structures within the bedding; contacts with encompassing shale beds; the sedimentary structure of surrounding beds; general thickness and strike and dip of bedding; and any disruption or faulting of the JOB. Samples were collected for thin section analysis. In thin section, the structure, size, and shape of ooids, sorting, post depositional diageneses, and chemical replacement can be observed. No attempt was made to analyze flow direction from the observed cross beds. At outcrops, cross beds were hard to find, sporadic, and most very faint. Most cross beds are seen by the differences in grain size. Also, due to the brittle nature of carbonate, exposures have been fractured and eroded. According to Stewart (1972), the most likely flow direction of the Johnnie Formation is from north-east to south-west. This is based on the fact that the Johnnie strata thicken to the southwest to about 5000 feet thick. The thickening of Johnnie strata follows the trend of upper Precambrian and lower Cambrian strata which all thicken from north-east to south-west.

Results and Discussion

Cross Bedding, Graded Beds, and Sorting

At all outcrops, except in the Mesquite Mountains, the JOB displays various types of bedding. The Mesquite Mountains are highly fractured due to a subsequent thrust fault within the area which destroyed all sedimentary structures. At all other locations very faint to some moderately developed small-scale cross bedding occurs in outcrop but varies from place to place. Where it is developed, it displays sub-parallel to planar beds delineated by grain size (Figure 7). No large-scale cross bedding was observed in outcrop. Normal and inverse grading is also observed in the JOB (Figure 8). Within the graded bedding strata, ooids range from fairly well

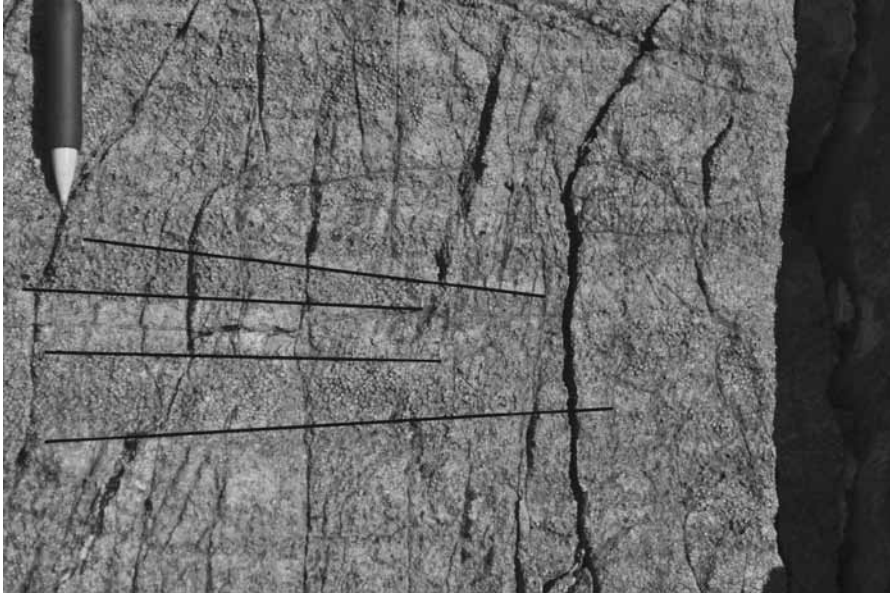


Figure 7. Planar to sub parallel cross beds are depicted by solid lines. The lighter color beds are finer grained ooids. Cross beds in the Johnnie Oolite bed (JOB) at outcrops are very faint and difficult to see. The differences in grain size accentuate the boundaries. Cross beds in JOB indicate strong currents as opposed to ripple type structures found in shallow water environments. The yellow tip of the pencil for scale is 0.60 inches long.

to poorly sorted; but in some beds the ooids appear to be unsorted or massive.

Graded bedding is an indicator of flow conditions during sedimentation. Stronger currents carry larger sized grains while weaker currents carry finer-grained particles. A normal graded bed displays larger grains at the base with fine at the top of bed. Inversely graded (smaller to large grain sequence) is not common but can result when a stronger flow occurs above weaker flow conditions. According to Tucker (1982), inverse grading can form during debris flows and massive or unsorted grains are an indicator of rapid deposition. The majority of bedding observed within the JOB is poorly sorted to unsorted, containing ooids ranging from 0.5mm to approximately 2mm deposited within a mud matrix.

Recent studies show that the deposits of subaqueous debris flows can produce

various sedimentary structures dependent on their physical properties during the flow. Marr et al. (2001) conducted flume experiments with slurries of low water/high mud content and high water/low mud content. The high mud slurry produced a deposit that was less structured while the low mud slurry produced a deposit with graded bedding and water escape structures.

Elveroi et al. (2010) conducted flume experiments using a slurry of water, sand, and differing amounts of clay content ranging from high content (25%), medium content (15%), to low content (5%). The results showed that the slurry with the high clay content remained compact and intact. The medium and low clay slurries started to weaken, losing their cohesion. The low clay slurry became turbulent with the break-up of the sediment load due to increased water content during the



Figure 8. The sample depicts coarse to fine then coarse grained ooids as seen between the lines. Note the sharp boundaries between graded bedding. Pencil is for scale and the black clip is 1.4 inches long. Ooids in this sample are fine to coarse sand size and considered as sand grains in a deposition environment. The sharp boundaries between the layers are a result of rapid flow conditions during the deposition. Normal graded beds transition from a coarse grain to finer grain with loss of current velocity. The inverse graded beds shown here suggest rapid flow conditions as found in debris flows. There appears to be some mixture at the boundaries.

flow. The studies suggest that during the debris flow, if physical properties change, the debris flow can produce a deposit with various types of graded bedding.



Figure 9. The arrow points to lenticular bedding approx. 0.75 inch at thickest area. The lenticular bedding is devoid of ooids and composed of micrite or carbonate mud. Lenticular bedding can occur when flow conditions change. The flow direction is obliquely or diagonally out of the photo indicating southerly flow.

This could possibly explain the unsorted to graded beds observed in the JOB.

Mud Clasts and Disrupted Bedding

Lenses of intercalated carbonate mud (micrite) layered within the JOB are a common occurrence at all outcrops. The mud lenses are devoid of ooids or contain few ooids. Mud layers form sharp contacts with surrounding oolite beds (Figures 9 and 10). Additionally, outsized mud clasts were observed floating within the oolite bed nearly perpendicular to bedding or edge-wise (Figure 11). Large clasts within a finer matrix characterize the strength or competence of the sedimentary bed during flow. Clasts oriented edge-wise (long axes perpendicular to bedding) can also give an indication of flow direction.

Restricted to outcrops in the Nopah Range and observed in the middle of

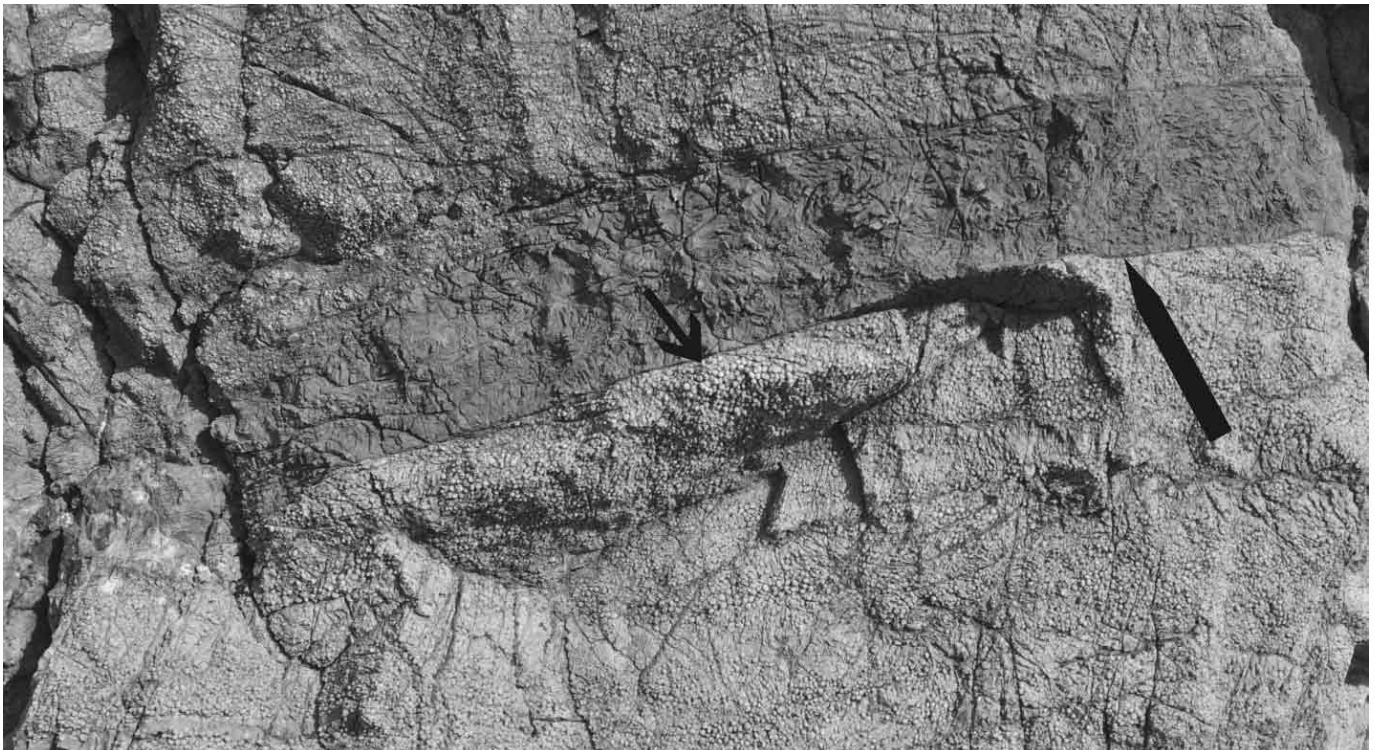


Figure 10. A 1.5 inch thick carbonate mud layer, containing sparse ooids, intercalated within the oolite bedding. Note the sharp boundaries at both arrows and the angular discordance with oolite bedding at smaller arrow. Conditions within the flow can fluctuate. Direction, strength of current and mechanical competence can render differences in sedimentary structures within a single flow.

the JOB is a layer containing numerous disrupted beds. Figure 12 shows a fluid escape structure and numerous floating mud clasts within an unsorted matrix of ooids. Figure 13 shows a large rip up clasts containing rounded clasts of previously formed ooids. Also observed at this location is an erosional bedding plane which cuts the lower half of the JOB (Figure 14).

Disrupted bedding can occur during deposition of sediments and also in a post-depositional setting. Both bedding disruption and fluid escape structures most likely result from rapid deposition of overlying sediment as well as liquefaction during earthquakes (Sylvester and Lowe, 1978; Tucker, 1982).

The subject of gravity-driven sediment flows and mechanics is very complex. Gravity-driven sediment flows, such as debris flows, grain flows, and turbidites, have the capacity to carry large (outsized) clasts within the flow. Simply stated, large clasts are carried along in a hyperconcentrated flow due to buoyant forces. Buoyancy is partially due to the ratio of clay and water within the matrix and size of granular solids, but other physics are involved (Hampton, 1979; Lewis and McConchie, 1994). The higher the mud content versus water within the matrix enhances the competency or strength of the flow and the ability to “lift-up” and carry the entrained larger clasts. In the case of the JOB, the abundance of carbonate mud probably contributed to the strength of the flow. Conditions in a hyperconcentrated flow can change as the flow proceeds. An increase or decrease in water and clay within the matrix and amount of granular solids can change the mechanics. As stated earlier, this could explain the various graded-beds found in the JOB.

Recent studies and flume experiments have also shed some light on the ability of some debris flows to run out over long distances on gentle slopes and obtain great speeds (Mohrig et al., 1998;



Figure 11. Edge wise mud clasts floating in Johnnie Oolite bed. The two clasts appear imbricated suggesting left to right flow favoring a southerly flow direction. The clast contains a few ooids. The on-edge clasts carried along within the carbonate bed indicates the debris, in this case the ooid grains, was competent to buoyant and carry along the clasts. Top of bed is located at the top of photo. The yellow tip of the pencil is approx. 0.60 inches in length.



Figure 12. The disrupted layer in the Nopah Range. The arrow points to a fluid escape structure shaped like a mushroom. As the bedding is disrupted either by rapid overburden of sediment or shaking during earthquakes, the grains become fluidized and can move upwards in this case. Lens cover for scale.



Figure 13. Disrupted layer within the middle of the Johnnie Oolite bed located in the Nopah Range. Note the rounded clasts of oolite within the disrupted layer. The length of the pencil is 6 inches.

Marr et al., 2001; Elverhoi et al., 2010). Hydroplaning can occur at the head of a clay rich debris flow. When the debris flow hydroplanes, the front, or head, is lifted up and cushioned by a thin layer of water which reduces friction at the base of the flow. This is analogous to a car losing traction and sliding when encountering a thin layer of water on the road.

The Johnnie Oolite deposit exhibits characteristics of a coherent mass flow. It contains a high amount of clay (micrite), most likely had the ability to hydroplane over the sharp boundary with the lower shale bed, and run-out over great distances at a very significant velocity. This is evident from its areal extent.

Hummocky Shale Beds

Above and below the JOB are deposits of silty shale beds. The shale beds

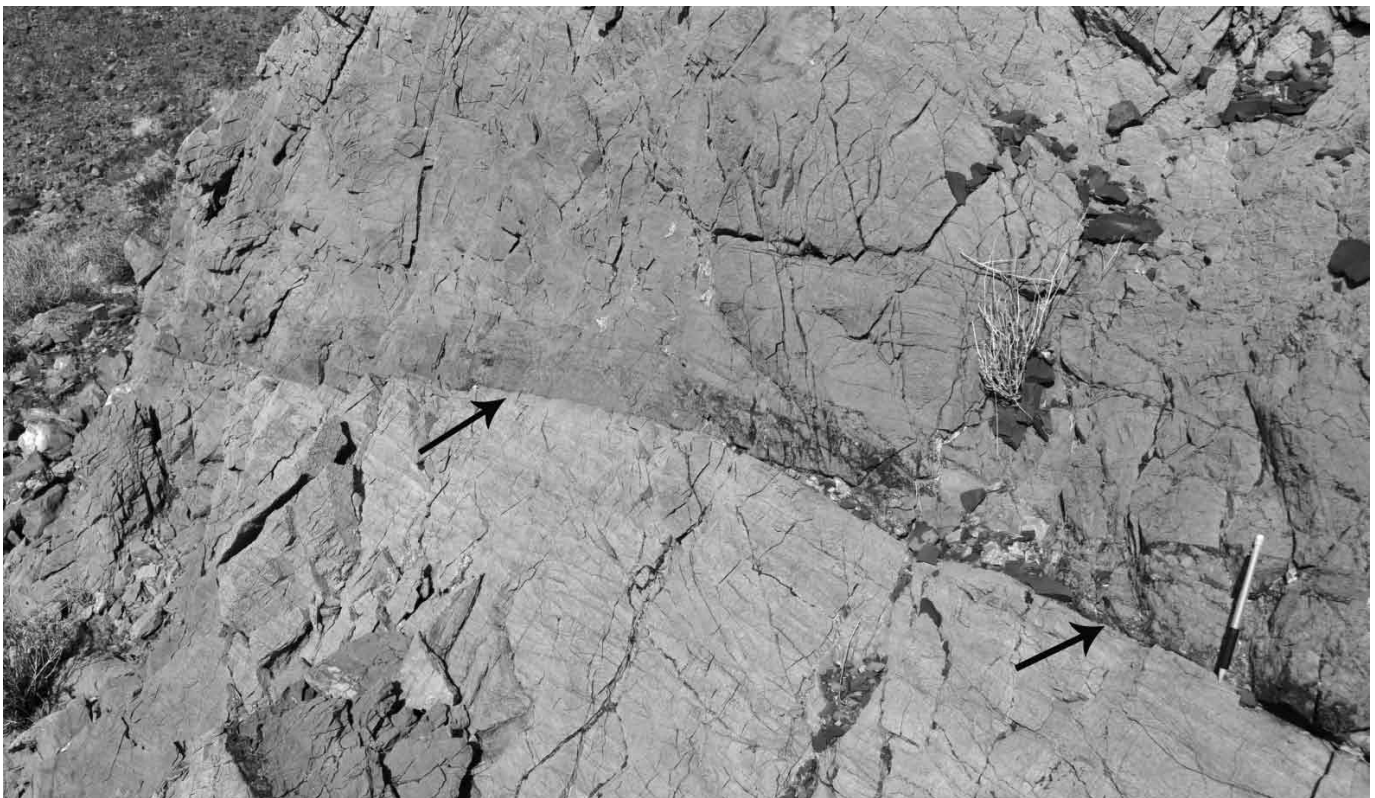


Figure 14. The arrows point to an apparent erosional surface. The oolite bed above the arrows was deposited after the lower bedding. Very faint discordant bedding is observed at the erosional boundary. Note the rounded rip-up clasts (Figure 13) to the left of the mechanical pencil. The pencil measures six inches in length.

encapsulate the oolite bed creating impervious boundaries. The contact of the lower shale bed and the JOB is sharp with rare scour and mixing of sediments only a few inches into the boundary; the lower shale bed displays hummocky cross stratification (Figures 15 & 16). The shale beds are non-carbonaceous. The occurrence of a fairly uniform carbonate bed sandwiched between two non-carbonaceous, siliceous silty shale beds is perplexing to some geologists. Uniformitarian dogma asserts that carbonates are usually shallow marine platform deposits while most shales form in slightly deeper marine waters.

Catherine Summa is an expert on the description of the Johnnie Formation. She completed a Ph.D. thesis on the sedimentology and stratigraphy of the Johnnie Formation from a secular worldview, and although there is disagreement on interpretation, her descriptions are empirical. Summa (1993) considers the JOB a high energy transgressive sheet deposit, which tracked sea level rise and also suggests that the overlying and underlying shale beds formed in a lower energy environment. She also describes hummocky shale beds associated with the JOB at various locations and other sedimentary structures indicating rapid deposition in the strata above and below the JOB.

Hummocky cross-stratification or bedding occurs in very large storms and is observed in recent hurricane deposits. The strong current flow may be unidirectional or oscillatory but the product is a series of thickening and thinning of the sediment forming mega ripples or swales with wavelengths up to 5 meters (Wikipedia, 2018). This information creates a contradiction in the uniformitarian interpretation. How do mega-ripples form in a low energetic current flow?

Thin Section Analysis

The following description of ooid structure and chemistry was summarized



Figure 15. Hummocky shale beds below the Johnnie Oolite bed in the Nopah Range. Shale beds are found at the bottom and top of the Johnnie Oolite bed at all locations. The shale beds encapsulate the oolite bed forming impervious boundaries. The mechanical pencil for scale is 6 inches long. Hummocky beds formed in modern times are the result of strong currents produced during storms such as hurricanes.



Figure 16. Note the sharp boundary at top of shale bed and bottom of oolite bed. Also note just below the camera lens cover there appears to be rip up clasts of the underlying shale bed. Lens cover for scale.

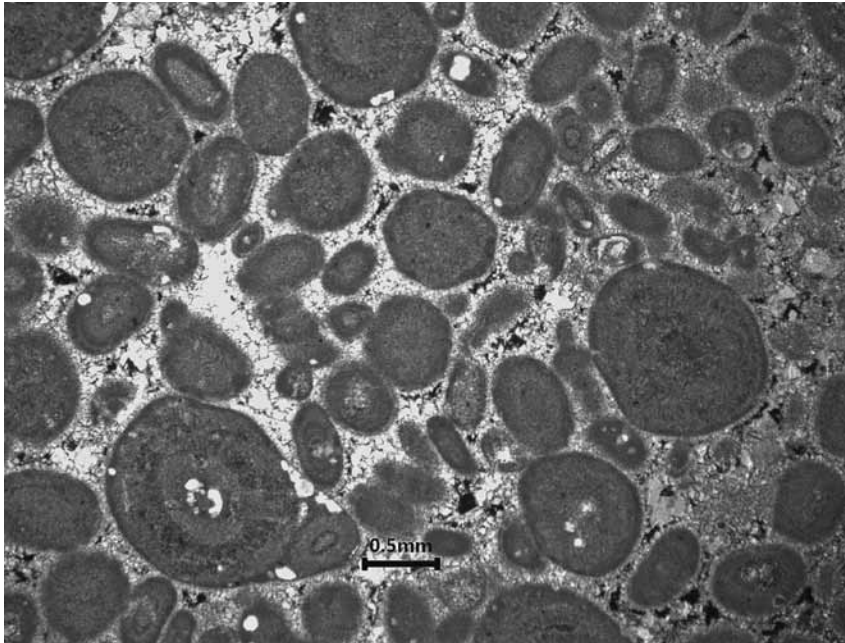


Figure 17. Notice the diversity of ooid shapes and sizes from rounded, oblong, ellipsoidal and rod shaped. A poorly developed composite ooid exists to the left of the scale bar. It probably didn't form together just joined during chemical diagenesis. Most of the ooids shown in sample are poorly developed and considered superficial ooids. Many of the smaller "ooids" are peloids of micrite. Image taken in plain polarized light (PPL).

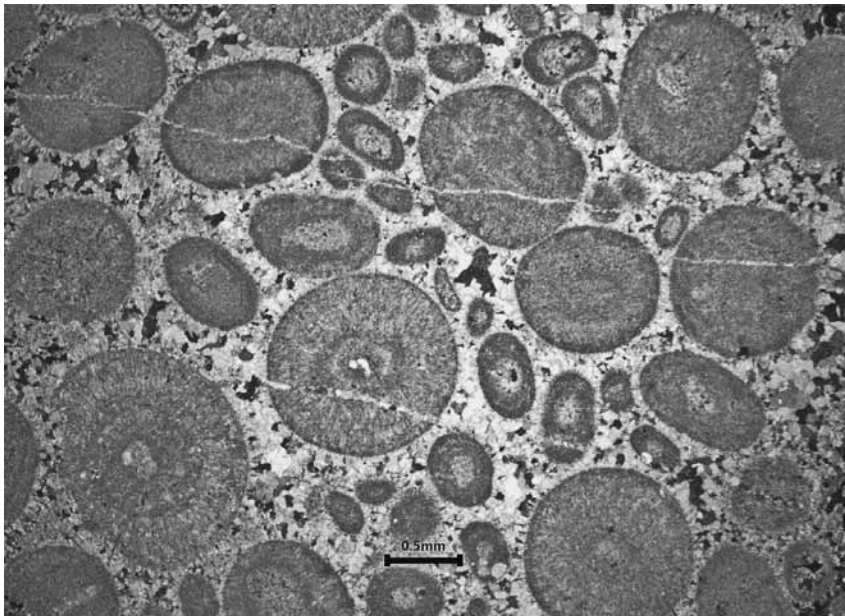


Figure 18. Sample taken in the western Spring Mountains. Note the diversity of shape and sizes of the "ooids." Most of these ooids are not well developed. The fracturing (thin white streaks) healed by quartz and calcite does not displace the ooids therefore it is due to chemical diagenesis not mechanical. Image taken with crossed polars (XPL).

from a report generated from Calgary Rock and Materials Services Inc. where the thin sections were made:

The ooids in thin-section samples exhibit similar textures and a variety of shapes and sizes from very round, ellipsoidal to oblong. The majority of ooids range in size from fine (0.125mm) to coarse sand (1mm) but a few are very coarse (2mm). Ooids display both radial and tangential structure showing minimal mechanical deformation. Radial structure is an indicator of less agitated current conditions while tangential structure represents combination of agitated and quiet waters (Davis et al., 1978). The cores are predominantly dolomitic micrite with minor quartz and feldspar.

The diagenesis of the Johnnie Oolite bed is mostly chemical in nature. Isopachous dolomitic cement coats the outer cortical layers of ooids and within the intercrystalline porosity, coarse sparry dolomite occurs. Where minor fracturing occurs, it is healed by silica and calcite cements. Some ooid cores are partially replaced by silica. (Personal communication)

Thin section analysis enhances macro-observations obtained in the field. Many ooids observed in thin section are poorly developed or not developed at all (Figure 17). Poorly developed ooids, referred to as superficial, contain only one or less developed cortical layer. Also a significant amount of so called "ooids" are just aggregates or clumps (peloids) of mud (Figure 17). It is well established that mud will aggregate and deposit like sand grains (Austin, 2008). Superficial ooids and the abundance of peloids may suggest the lack of time for ooid development during the JOB grainstone mud flow. Differences in sizes, shapes, and sorting of well- to poorly-developed ooids were also observed in thin section (Figures 17 & 18). A few ooid shapes suggested active compaction during

deposition of the JOB. A rip-up clast within the disrupted bedding indicated that some previously formed ooids had been redeposited (Figure 19).

Most of the thin section samples revealed post-depositional chemical diagenesis. In Figure 20, it appears that the ooid was destroyed by the replacement of dolomitic cement. Sparry dolomitic intercrystalline cement is observed in all samples. Many ooid cores are replaced with silica and calcite and silica also heal fractures within ooids (Figure 18).

Ooids in thin section provide no direct indication of the velocity of the deposit. Ooid formation is a dynamic process, as discussed earlier, and does not require deep time. Under laboratory conditions, ooids have grown at a rate of 0.17 mm per day (Bakr et al., 2015). So it is possible for ooids to form fairly rapidly. Analysis of macroscopic sedimentary structures within the outcrop is necessary to evaluate the flow conditions and rates of deposition.

Conclusion

The Johnnie Oolite bed (JOB) is a significant deposit for both the secular geologist and the biblical catastrophist. It has helped the pioneer geologists map the stratigraphy without bias, and has revealed to biblical catastrophists the nature of likely early Flood deposits. The JOB is composed of grains of ooids and minor lithic fragments in a mud matrix. During the grain-flow, ooids formed in supersaturated carbonate slurry. Some ooids are well developed but most are superficial or peloids of micrite and vary in size and shape. Field observations of the JOB reveal many sedimentary structures that indicate rapid deposition under mass flow conditions. The ooids display cross bedding to planar bedding and are normal to inversely graded. However, most of the bedding is poorly sorted to unsorted. Outsized clasts within the oolite bedding are an indication of strength and competence

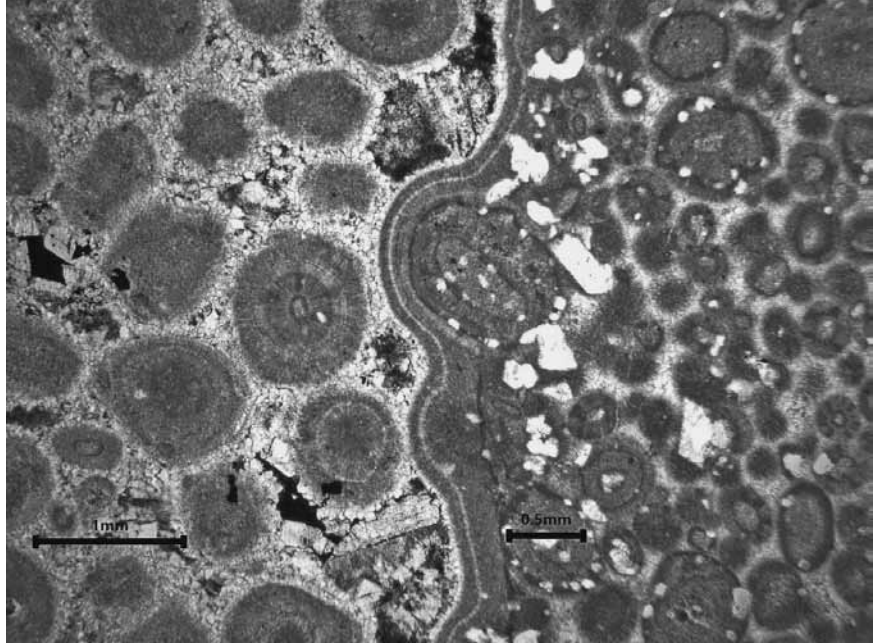


Figure 19. On the right is a rounded rip up clast composed of ooids found in disrupted bedding. Note the smaller ooids within clast with abundance of pseudo ooids or peloids. The Johnnie Oolite bed on the left side displays matrix supported “ooids.” Note the Isopachous cement coating the clast on the right side. Also ooids are coated with sparry dolomitic cement occurring post depositional. Image taken in PPL.

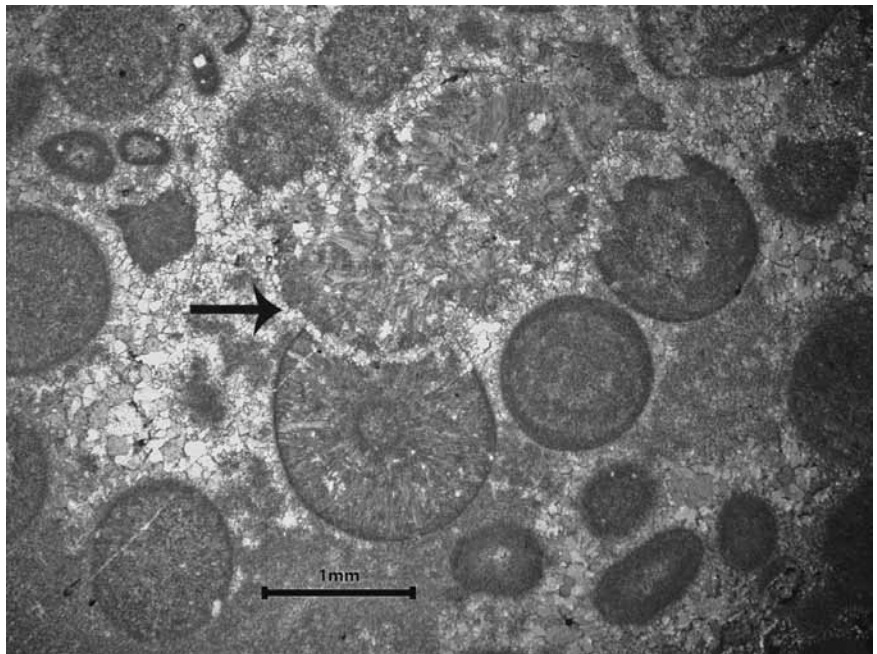


Figure 20. The radial fabric of an ooid destroyed by recrystallization of sparry dolomitic cement. Note the arrow pointing to isopachous cement coating destroyed ooid and the ooid below. Isopachous equant cement texture is generally associated with meteoric zone environment. Image taken in XPL.

during the mass carbonate flow. An erosional bedding plane within the middle of the JOB in Nopah Range contained numerous rip-up clasts and fluid escape structures indicating an energetic depositional environment. The JOB probably lost cohesion and became turbulent during this phase of the flow. Hummocky cross-stratified shale beds enclose the JOB at all locations. Field observations and thin section analysis indicate that flow conditions during deposition of the Johnnie Oolite were fairly rapid while the ooids and peloids formed in transit during the flow event. The JOB is considered a likely early Flood deposit which occurred after the breakup of the Fountains and the deposits of the underlying Noonday Dolomite and the Kingston Peak Fm in the study area.

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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.

Theodynamic Operators: A Proposal

In a previous letter (Rinehart, 2019) I proposed that “biblical creationist theory, which deals scientifically with the natural effects of the supernatural Creator and Lord, ought to be equipped with concepts representing divine causal action,” and called for “a formalism representing direct divine action on matter-energy in space-time, in those events (like the Flood) where Scripture clearly reveals it.” In this spirit, the present letter outlines a notion of a *theodynamic operator* (Θ_{Δ}) representing God’s deployment of angelic operative power within natural physical systems.

Consider the general case of a divine intention to affect some particular change within some domain of created nature, by means of direct action. In this case the action accomplishes a correspondence between the divine intention in the domain of eternity and the intended physical effect in the domain of nature, fulfilling the definition of a mathematical operator. What do I mean by this? In analytic terms, an *operator* is a correspondence defined on a fundamental domain between each element of that domain and another element of the same or a different domain (Schmeidler and Dreetz, 1974). In the analogy I am proposing, the fundamental domain is that of the divine intentions, and the different domain is that of physical nature. By affecting the correspondences between eternal divine intentions and created natural beings, these actions function like mathematical operators. This is not to suggest that divine actions are mathematical operators, but that at least when engaged in the kind of

operations we are considering, they can be *represented* as such for theoretical purposes, by way of analogy. Thus in general,

$$T_U > \Theta_{\Delta} > \Delta\Sigma_N,$$

where T_U is the uncreated Trinity, Θ_{Δ} is the theodynamic operator representing divine action, and $\Delta\Sigma_N$ is the change in a natural system produced by the divine power of the action.

In the case of the Flood, the Lord had a ready-made ensemble of geological structures and processes in place, their forms known in detail by His omniscience, with which to work in carrying out His intention to inundate the lands of Earth. Whether He accomplished this supernatural cataclysm by some form of catastrophic plate tectonics (Austin et al., 1994), or whether by vertical tectonics of uplift and subsidence (Reed, 2000), or by some other means, it is reasonable to hypothesize that the formation and control of mantle plumes would play a major role. Opening the fountains of the great deep along the oceanic rift system, whether or not this resulted in plate tectonics, would have required sheet-like plumes of magma reaching the surface, roughly according to the geometry of their initiation near the core-mantle boundary. (“The mountains melt like wax before the Lord, before the Lord of all the earth” [Ps. 97:5 NIV].)

Suppose that the Lord specified a set of theodynamic operations with their operative power concentrated in a pattern of locations surrounding Earth’s core.

In geocentric spherical coordinates, the theodynamic operations would be focused on a spherical surface of radius (r) about 3400 km.—the core-mantle boundary—in a pattern of locations specified by the two spherical coordinates (ϕ, λ). Suppose further that the operative power here deployed consisted of pulses of thermal energy, coupled with inertial forces directed toward r -axes toward the surface. Algebraically,

$$T_U > \Theta_{\Delta} (E_T + F_I): (r, \phi, \lambda),$$

where T_U and Θ_{Δ} are again the uncreated Trinity and the theodynamic operator, respectively, E_T and F_I are thermal energy and inertial force, represented as component functions of Θ_{Δ} in this analysis, and (r, ϕ, λ) are the spherical coordinates whose specific values indicate the locations in which the operative powers are focused.

Now the supernatural introduction of thermal energy and inertial force into Earth’s deep mantle would seem to violate the conservation of energy as viewed within the frame of natural processes. But precisely because these operations are supernatural, and are directed by the Creator of all physical energy, production of the requisite magnitudes of heat and momentum would be unproblematic (just as Jesus’ feeding miracles violated the conservation of matter). If the Creator wished to keep the conservation law, the requisite magnitudes could easily have been subtracted from the energy of the sun, for example, in comparison to which they would be miniscule.

The point of the foregoing proposal is to exemplify tentatively a “formalism representing direct divine action on matter-energy in space-time,” so that Flood geologists in particular need not be limited to seeking *only natural* explanations for the *onset* of this supernatural cataclysm. As with my previous communications to *CRSQ*, it is hoped that these considerations might stimulate the thinking of creation scientists as we enter a new decade of research to the glory of God.

Larry Rinehart
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Reply to Tomkins et al.

I was saddened to read the recent article (Tomkins et al., 2019) attacking the Septuagint (LXX). This is for two reasons. First, in my view, the article exhibits poor biblical scholarship. Second, the tone of the article mocks creationists with differing views. While I begin below by noting errors and omissions, the attack on fellow creationists is, to me, most troubling. Our views may differ, but we are commanded to treat each other with respect and courtesy.

The article is styled as a broadside attack on the LXX, but one suspects the primary motive is to discredit the LXX with respect to the chronologies of Genesis 5 and 11. As most readers of this *Quarterly* are well aware, there are jarring differences between the LXX and the Masoretic Text (MT) in those chronologies. For twelve of the patriarchs, six pre-flood and six post-flood, there is

a difference of *exactly* 100 years in their “begetting” ages (i.e., how old they were when the next in line was born). For a thirteenth patriarch, post-flood, the begetting age differs by *exactly* 50 years. These cannot be copying or translation errors; something deliberate is going on. The LXX also names a patriarch (Kainan, also written Cainan) with a begetting age of 130 years who is *not* mentioned in the MT (but is mentioned in the genealogy of Jesus in Chapter 3 of the Gospel of Luke). The combined effect of these differences is 1380 years. The LXX has a longer chronology going back to Creation—600 additional years before the Flood, and 780 additional years after the Flood. (There is also a minor difference of six years in the begetting age for Noah’s father Lamech. For this, the MT records 182 years and the LXX 188. There are reasons to conclude

that the MT number is accurate in this case.)

Errors

In its attack on the longer chronology of the LXX, I believe the article by Tomkins et al. exhibits poor biblical scholarship in the following areas:

1. The article correctly notes that some copies of the LXX have Methuselah living 14 years beyond the Flood (a begetting age of 167). But the article errs when it claims “no LXX advocate has offered a forensically reliable remedy to this error.” As early as the fifth century AD, Jerome called the difference in Methuselah’s begetting age “a celebrated question.” He said there was a mistake in the numbers and concluded the correct figure was 187 because he found that number “both in the Hebrew books and in

those of the Samaritans.” About the same time, Augustine also attributed the difference in Methuselah’s begetting age to a copying error and claimed he had seen three LXX manuscripts (and two other ancient texts) with the 187 age. Modern scholarship documents these and other ancient sources in favor of the 187 age, and sheds light on how the copying error occurred (Smith, 2017).

2. The article states “a thorough historical analysis of ancient documents indicates that what we call the Septuagint was most likely written during the first century AD.” This statement is surprising; I believe no credentialed LXX scholar would agree. A 100-page analysis concluded the LXX was translated in 281 BC (Collins, 1992). The book *Invitation to the Septuagint* suggests the Penta-teuch was first translated into Greek around the year 250 BC (Jobes and Silva, 2015), and quotes Emanuel Tov for the proposition that the initial translation of most canonical books had been completed no later than the middle of the second century BC (Jobes and Silva, 2015, p. 32).
3. The article makes the novel claim that the LXX editors had the opportunity to insert New Testament quotes into the LXX, because “no such ‘before-Christ’ copies exist.” Yet LXX fragments believed to precede the birth of Jesus have been found in caves in the Judean desert (Marcos, 2000).

Omissions

In their article, Tomkins et al. do not mention arguments in favor of the LXX chronologies for Genesis 5 and 11. This suggests bias. I list below some of these arguments. I do not claim my list is complete. I only suggest this issue merits careful scholarship.

1. There are surviving ancient non-biblical witnesses to the chronologies

of Genesis 5 and 11. All follow the LXX mold. One is Josephus. Josephus explicitly states that he worked from Hebrew biblical texts and that the history recorded in the Hebrew Bible spans 5,000 years. (In the MT, the chronology back from Josephus to Adam is reduced to about 3,700 years.) Josephus repeats the longer begetting ages of the LXX for *all* of the pre-flood patriarchs and explicitly confirms the begetting age of 187 years for Methuselah. Another ancient witness is Demetrius, who lived in Egypt ca. 220 BC. He used the LXX and wrote in Greek. The chronology developed by Demetrius is clearly based on both the longer chronology of the LXX *and* a begetting age of 187 for Methuselah. (Demetrius is also a witness against the theory that the LXX was created after the birth of Jesus.)

2. The LXX translators had no further control over their document. Tomkins et al. are correct that errors multiplied as the LXX was copied over the centuries, and careful scholarship is needed to best ascertain the original text. But the simple point here is that if the LXX had so obviously and repeatedly differed from the Hebrew texts then in existence, those differences in the Genesis chronologies would have been noticed and corrected. Yet there is no known discussion of the issue before Eusebius (AD 306–373), who wrote almost six centuries after the LXX was created.
3. In contrast, the rabbis who produced the MT possessed adequate motive, authority, and opportunity to shorten the chronology. After three disastrous wars against Rome, Judaism was in ruins. The Jews were no longer a political state, the sects of the Pharisees and Sadducees had mostly vanished, and it was left to the rabbis to preserve the faith. The third war, the Bar Kokhba Revolt,

was led by a Jew who openly claimed to be the messiah. The rabbis could have been motivated to shorten the Genesis chronologies to both cool down messianic fever and to counter Christianity, with its claim that Jesus was the messiah. Many Jews living at that time believed the messiah would arrive in the 6th millennium following creation, after 5,000 years had passed. According to the MT chronology, the messiah was yet to come, and Jesus came too soon (roughly 4,100 years after creation). Using the LXX chronology Jesus was born around 5,500 years after creation. By decreasing the chronology, the rabbis could both discredit Jesus as the messiah and deflate messianic fever.

4. One rule for understanding any document, including the book of Genesis, is to attempt to give meaning to all of its parts and to avoid to the extent possible rendering parts of the document useless or silly. By this rule Genesis 25:7–8 is a powerful witness in favor of the LXX. Genesis 25:7–8 tells us Abraham died at age 175 “in a good old age, an old man and full of years.” Using the MT chronologies, when Abraham died his great-great-great-great-grandfather Eber was still alive, and died about 34 years later at age 464. Since the patriarchs between the Flood and Terah (Abraham’s father) all had “other sons and daughters,” the MT chronology suggests that, when Abraham died, there were hundreds, perhaps thousands, of people living besides Eber who were centuries older.
5. The MT places the Flood around 2500 BC; the LXX places the Flood around 3300 BC. We cannot ignore the overwhelming historical evidence, what we know about the civilizations of Mesopotamia, Egypt, and China, supporting the LXX dates. There is a strong argument that only the LXX allows adequate time for the repopulation of the earth and the

birth of these and other civilizations. I believe this is an important consideration; I have found the shorter MT dates are a significant barrier in the view of many to the concept of biblical Creation.

The Importance of Tolerance

As noted, what saddens me most about the article by Tomkins et al. is what I perceive as disrespect to those of us who believe the LXX chronologies, or any other specific parts of the LXX, best preserve the original scripture. I do not mean to suggest the LXX is wholly superior to the MT; to the contrary there are good reasons to conclude that, overall, the MT may be a more faithful reproduction of the ancient texts. One should not ignore that the rabbis toiled for hundreds of years to refine the MT.

But disrespect is poisonous. We must always be willing to look at both sides

and, should it be necessary, to agree to disagree. We should respect others and the views of others even if we do not share them.

Our community is small. We face strong prejudices and obstacles. I believe biblical Creation has the power to change the world. I believe that by sharing the wondrously good news that the Bible is true from beginning to end, that it can be trusted, we can change lives. I hope we can do it together.

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Reply to Douglas Ell's Letter to the Editor

First, we want to thank Attorney Douglas Ell for taking seriously our research article in the summer 2019 issue of *CRSQ*, 56(1):40–47, "Extensive Messianic Prophecy Corruptions and Flood-related Chronology Errors Disqualify the Septuagint (LXX) as a Reliable Source for Creationist Research."

Also, we appreciate that Attorney Ells cares about biblical scholarship (which we take very seriously, as did our well-qualified peer reviewers) and how creationists are treated (which we three young-earth creationists obviously care about). Likewise, as does Attorney Ell, we very much care about how the

truth (including the relevant historical facts, informed by relevant Scripture) is faithfully investigated, analyzed, and discussed in scholarly venues like *CRSQ*.

Please realize that we have been surprised to learn that there is no physical document that matches today's "Septuagint" that is separate from Greek texts of the Apocrypha and New Testament books. That means what we today call the "Septuagint" text documents are, forensically speaking, newer (i.e., physically produced at a more recent time) than the portion of New Testament books that we now have. Learning that has been very surprising—if not shock-

ing—for us as we have tried to evaluate what "LXX" really is (or is not). Other evidentiary factors were covered in our article, and are already covered in our reply (Johnson and Daniels, 2020) to an earlier letter to the *CRSQ* editor.

Please appreciate that it is difficult to defend the preserved Masoretic Hebrew Text—which fits Romans 3:2—without appearing to "attack" the Septuagint Greek translations that only appear in Alexandrian texts like Sinaiticus, Vaticanus, and Alexandrinus. Yet most *CRSQ* readers (like our earlier selves) probably do not realize that what is today called the "Septuagint" (Greek translation)

“text” is not a pre-N.T. document that is physically separate from the Alexandrian (O.T. + N.T. + Apocrypha) texts that we today call Sinaiticus, Vaticanus, Alexandrinus, etc. Accordingly, no Protestant should be surprised that we reject the Apocrypha (which historically existed in Greek, not Hebrew) as not being part of the Holy Bible that God gave to His children as Scripture. However, how many know that the Apocrypha books are part of the same post-N.T. Greek texts that contain the books that today are called the “Septuagint”? Why do we say that the seminal “Septuagint” texts are “post-N.T.”? Because those same Greek texts which include O.T. books in “LXX” translations—along with the Apocrypha books (which only came as Greek texts)—are part of the same documents that also contain texts of most of the Greek N.T. books!

Actually, learning about the historical provenance—as well as many assumptions regarding critical facts not actually in evidence—have caused each of us (co-authors) to change our earlier assumptions and conclusions about popularly taught concepts of biblical text transmission (in general), as well as popularly taught notions (in particular) about the production and use of Septuagint-containing Greek translation texts (i.e., Sinaiticus, Vaticanus, Alexandrinus, etc.). If our research surprised anyone at all, know that it surprised us first.

But, as you reconsider what we have presented in our *CRSQ* article, you might do so with conscious regard to the Rules of Evidence, since you are an attorney, and because this topic involves a lot more forensic science (discovering the truth about no-longer-observable facts, primarily using reliable eyewitness reports) than it does empirical science; observing physical facts in the present (Johnson, 2015, 2016).

With these preliminary thoughts in mind, please consider these numbered points responding to your criticisms

(some of which contained implied assumptions that we once held, yet now no longer consider to be reliable assumptions).

1. You have noted well that Jerome trusted that 187 was the correct number, because he found it “both in the Hebrew books and in those of the Samaritans.” That is saying that even Jerome, when talking about reliability, focused on the Hebrew over the Greek. He got the 187 from the Hebrew. And the Hebrew text predated the Samaritan Pentateuch. See Johnson (2012) noting: “JEDP advocates try to date the Hebrew Pentateuch’s text (what the Samaritan Pentateuch is copied from) to be centuries later than the ancient Samaritan copies made from it—an impossible case of an effect preceding its own cause!”

If we are talking about a text with errors, please note that the Hebrew text has been consistent among its copies. Whether using a Hebrew text from the 1400s or 1000 AD, there is virtually no difference at all. Plus, consider the various Hebrew Dead Sea scroll texts, with virtually zero provenance (and no evidence that it was copied by an orthodox Levite), have far less differences in the Hebrew than between Greek Alexandrian-type manuscripts. It seems a bit of a stretch to trust seriously conflicting Greek translation manuscripts, while admitting they don’t actually make sense. This is especially true, when admitting that the proper number (187) is derived by looking at the Hebrew text in the first place!

2. Please examine the claims for yourself regarding the alleged dates for the Septuagint’s composition. That is what I (David Daniels) did in the book, *Did Jesus Use the Septuagint?* Accepting an estimated date, just because others accepted it (and did so apart from serious provenance analysis, needed for forensic reliability) is not a sufficient reason for that date to be relied upon as correct.

3. The text accepted today as “the Septuagint text” is found in the Ralhfs-

Hanhart *Septuaginta*. That text is not based upon any manuscripts from before the apostles. It is compiled, instead of the Codex Alexandrinus, then modified by either or both Codex Vaticanus and Codex Sinaiticus. Alexandrinus is now supposed to have been written about 450 AD. Vaticanus has no real provenance before it appeared in the Vatican Library’s Catalog 1,000 years after that—in 1475 AD! Even Erasmus, writing to the Vatican librarian, did not trust its supposedly ancient text. Sinaiticus has no documented provenance before 1844 (by the West), and in my (David Daniels’) book *Is the “World’s Oldest Bible” a Fake?* I make the case that it was not “ancient” at all, and that there is evidence that it was composed around 1840 AD. This specific subject is further documented in a book I am now writing, but which is already chronicled on YouTube in the video series, “Sinaiticus Timeline.” These being the three main “Septuagint” texts, none has the distinction of having a documented provenance showing existence as a pre-1st century (AD) document, or of matching the text or wording of a pre-1st century (AD) document. However, the *Hexapla*, composed under the auspices of Origen, in Origen’s column alone has a text that was later used as the institutional (i.e., Catholic) church’s text.

4. I dealt with the supposed testimonies to the Septuagint in *Did Jesus Use the Septuagint?* It is not very long and you may find it worth a read. You may also want to read the reply to a previous letter on this topic (Johnson and Daniels, 2020).

5. We have the variations of Aquila (around the 120s AD), Symmachus and Theodotion (around 170s–200 AD) decades before Origen. And in each text I’ve checked, Aquila, Symmachus, and Theodotion have a text comparable to the Hebrew. Only Origen’s column is quite different. Origen had the New Testament in front of him. It is therefore not unusual that he would have copied

the New Testament wording back into the Old Testament references. Psalm 14:3 (LXX 13:3) vs Romans 3:13–18 is a case in point.

So the only link, it seems, between the reading of the New Testament and the “LXX” reading, is Origen himself, who lived two centuries *after* the New Testament was written! (There are many problems with Origen—but that’s a subject for another day.)

6. The problem with a theory against the Hebrews is the lack of evidence (i.e., evidence that has any forensic validity) for the story. Consider that Paul identifies the Jews as the custodians of God’s oracles (Rom. 3:2). This is actually the strongest proof that God gave and preserved the Old Testament Scriptures in Hebrew. God, being sovereign, can providentially ensure that His miraculously delivered Hebrew text would be preserved, in the proper manner, with the proper words. As our article notes, no one should assume that God failed to preserve the original text of His Hebrew Bible. That would be saying, in effect, that at least a few of the very words of God were lost. But the Bible is the testimony of God, and more specifically, of Jesus:

And beginning at Moses and all the prophets, He expounded unto them in all the scriptures the things concerning Himself. (Luke 24:27 KJV)

And he said unto them, These *are* the words which I spake unto you, while I was yet with you, that all things must be fulfilled, which were written in the law of Moses, and *in* the prophets, and *in* the psalms, concerning Me. Then opened He their understanding, that they might understand the scriptures. (Luke 24:44–45 KJV)

Just because some (who are called “scholars”), who conveniently ignore the usual rules of evidence, can imagine a scenario in their minds, that doesn’t fit Paul’s statement in Romans 3:2, does not make a scenario probable or even

possible. (Hypothetical scenarios, without any forensic proof, are illustrated by Christ’s discussion that climaxes in Matthew 22:29. In other words, Septuagint/Apocrypha advocates may be entitled to their own hypotheticals, but not to their own universe—because God rules the real universe.)

In fact, the ancient Hebrews were scared to add to or take away from His words (as originally delivered unto them). Even to this day, there are some levels of safeguards in synagogues, to make sure that they read and handle the words of God correctly. No such historical counterpart exists for those who deal in Greek translations of the Hebrew original text.

7. When we come to a passage that we do not comprehend, it is not rational to then assume it has an error in it. It is only reasonable (in light of John 17:17) to state that we do not understand it. The Bible itself cautions us that there are many biblical passages that are difficult to understand (see 2 Pet. 3:16). It is not logical to decide that we should change them. Remember that the Hebrew manuscripts themselves have been unchanged for thousands of years. If they were such a problem, why did they not change these, as they supposedly changed the dates in early Genesis? Why, in short, did they change the ones without changing the others to make them all consistent (according to your manner of thinking)? If you accept a redacted Hebrew O.T. text, as did Brevard Childs in his “Canonical Criticism,” then would not the redactor have done such a job as to make it consistent across all the text? And the example you have given in Genesis is *the very same book*. Did they stop at chapter 5, and decide not to “fix” anything else? Why do the one, without also fixing the other? In other words, assuming a redacted Hebrew text trades one imagined “problem” for another.

8. The heathen nations of ancient time had reason to want their god to be older

than their rival’s god. Whichever god was older had to be a more original god. So god-fights in terms of dating are logical, but God’s people had no reason for such a thing. And since the Hebrews from the line of Noah and Shem were not associated with building the tower at Babel, their language was not confounded. So their chronology was most likely the only one in the original language, and also guaranteed to be the one passed down from before the Flood and thus uncorrupted. It makes no sense to abandon that record in the favor of battling chronologies of the pagans, which got so ridiculous as to have kings living well over 1,000 years, when the longest living man (pre-Flood) was Methuselah, at 969, no one reaching 1,000. It might even be the reason for the 1,000 years, or Millennium, at Jesus’ return—to show what was originally intended for humans.

9. I agree that disrespect is poisonous. But that is also a two-way street. Disagreement is not disrespect. And neither is it “poisonous” to locate where people are being led to doubt that God can keep His own promise to preserve His own words in His own book, which He “committed” to the Jews (Rom. 3:2). God said through Solomon:

Every word of God *is* pure: He *is* a shield unto them that put their trust in Him. Add thou not unto His words, lest He reprove thee, and thou be found a liar. (Prov. 30:5 KJV)

If there is not a preserved text, then we cannot “share the wondrously good news that the Bible is true from beginning to end.” Wouldn’t that be equivalent to us likewise being liars? But the Bible is very clear on that point, no matter what text one uses:

God forbid: yea, let God be true, but every man a liar; as it is written, That thou mightest be justified in thy sayings, and mightest overcome when thou art judged. (Rom. 3:4 KJV)

It is our observation that more harsh criticism has been levied against

those who believe God has preserved His original Hebrew words (in the Old Testament), than those who do not believe that God has preserved His words anywhere, at any time, in any document. Other critics — not you — have faulted us for disagreeing with Roman Catholic traditions, which is unsurprising because all three of us are Protestants. Because our scholarship differs from the official tradition of the Roman Catholic church

we have been called “Catholic bashers” (by the website postings of others who reject our article’s data and conclusions). But to simply disagree with the dogmas of another religion is not *per se* “poison” or “bashing.”

May God lead you into all truth.

**In Christ Jesus, and for His service,
David W. Daniels
(for the CRSQ article’s
three co-authors)**

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The Marsupial Fossil Record is Not Compelling Evidence for a K-Pg Flood Boundary

The Marsupial Fossil Record is a tough question that Flood geologists need to consider in relation to the post-Flood boundary. Chad Arment posited a unique thesis by calculating the likelihood of marsupials being found on a single continent both before and after the Flood (Arment, 2020). He wrote: “we can place a post-Flood boundary at different positions in the stratigraphic record to calculate the probability of multiple marsupials returning to the same location in which their pre-Flood ancestors allegedly lived.” He tends to conclude that the Cenozoic marsupial fossil record is essentially post-flood. He also wrote that invoking a divine guidance, to lead animals to the Ark and back again, would be simply God-of-the-gaps theorizing.

God-of-the-Gaps

However, the Bible is the authority on which we must build our thinking. So, was God in control when those genera-

travelled their way home? Obviously, every believer will admit He was. In fact, ruling out divine guidance creates a gap wherein God was inactive, which implicates that Arment himself is theorizing about a God-of-the-gaps.

Arment seems to think that animals did find their way randomly, after departing the Ark. But, did these animals find their way to the Ark by random migration as well? No, God was in control. He had a plan, which He obviously continued after the Flood. It is therefore a fundamentally incorrect method to calculate the probability that an animal will reach its native continent.

Difficulties with an Earlier (K-Pg) Flood Boundary

An early post-Flood boundary as suggested by Arment (2020) has many difficulties:

- As he defines all Marsupial (and even wider all Metatherian) fossils

post-Flood, where are the fossils from this group that were killed in the year of the Flood? By dismissing evidence for the Flood, it becomes more difficult to substantiate the biblical Flood, which is what creationism is about, as Flood geology forms the only physical evidence against the evolution theory.

- Mike Oard (2019), Timothy Clarey (2019a, 2019b, 2020), and many others considered plenty of geological evidence to underpin a late Flood boundary. All of which has been neglected in Arment’s paper, which was very limited in scope. In fact, Clarey (2019b) showed that there was continuous deposition of extensive marine rocks, including limestones, across much of Turkey, the Middle East, Europe, and North Africa from the Cretaceous level all the way up to the Miocene and even Pliocene levels. He further pointed

out that it is difficult to get off the ark if the region was still covered by ocean water (Clarey, 2019b).

- Miocene salt tectonics underneath the Mediterranean Sea were only possible in Flood conditions (Heerema, van Heugten 2018). The salt magma interfingered with Flood mud and solidified into salt pillars within the sedimentary layers above the salt. This cannot be explained in any post-Flood scenario.
- Cenozoic sedimentary layers show worldwide similarities which point to a worldwide watery catastrophe (Clarey, 2019a, 2019b, 2020). So, if they are post-Flood, then God was lying in Genesis 9:9–11: “I now establish my covenant with you and with your descendants after you and with every living creature that was with you—the birds, the livestock and all the wild animals, all those that came out of the ark with you—every living creature on earth. I establish my covenant with you: Never again will all life be cut off by the waters of a flood; never again will there be a flood to destroy the earth” (NIV).
- If Cenozoic layers are post-Flood then the countless amounts of animals that were killed and fossilized therein can be blamed on Him for not keeping His promises. Especially the genera that went extinct. That is opposite to the testimony of Christianity.
- “A major biblical difficulty with this is that in II Peter 3:5–6 we are told that in the last days people will be willingly ignorant of Noah’s Flood. But how could anyone be willingly ignorant of something for which there is so little evidence, which would be the case if so much of what we see on the surface of the earth was caused by local events?” (Manning, 2020)

Plate Tectonics

Arment (2020) wrote: “*All continents are believed to have been attached to-*

gether as part of a much larger supercontinent.” His supposition is catastrophic horizontal plate tectonics during the Flood. Obviously, as he claims, this conflicts with the ecological zonation of fossils within the Phanerozoic strata. But how could the water-surprised animals be fossilized in their habitats if it slides thousands of miles away from them? Therefore, creation scientists need to reconsider the explanatory power of the timing of horizontal plate tectonics. The standard model starts plate tectonics at the first day of the Flood in Precambrian. A more reasonable moment to separate the continents is the third day of Creation Week. Then God Himself moved the continents, made the midocean ridges, and created the differences between oceanic and continental crust. This implies that Creation Week included the early Precambrian.

God in Control

Now it all becomes a logical conclusion that:

- God created high continental endemism in Creation Week.
- God brought the marsupial genera, among other animals, to the Ark.
- God did send the Flood, which deposited kilometers of thick layers of sedimentary rock upon the continents up to Late Cenozoic (Clarey, 2020).
- God used some type of vertical tectonics and volcanism to level the continents (McGuire, 2014). Vertical tectonics in combination with salt tectonics can explain the large deformation of sedimentary layers.
- God may have used deadly volcanic gases to kill all survivors. These gases prevented the raven and the dove that Noah had sent out to land, although tops of mountains were visible (Gen. 8:5–9).
- God commanded Noah to disembark in the very Late Cenozoic when the Earth was dry.

- God created high continental endemism again by bringing genera back to their original continents, in line with his plans in Creation Week. Oceanic dispersal has been suggested as one way to arrange it. However, it was not random as suggested by Arment, but God controlled it.

Conclusion

Contrary to what Arment wrote, the marsupial record cannot be post-Flood. It follows that high continental endemism was created in creation week and recreated after the Flood. Therefore, it is proof that God not only led animals to the Ark, but also back.

Stef Heerema

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To Those of Evolutionary Bent:

This is the story of a wasp (*Pompilidae*) and a spider (*Ctenizidae*), or the trap-door spider. The two have a peculiar relationship: the wasp uses the spider as a larder for its young, laying its egg (or eggs) on or inside the living spider, placing the paralyzed creature back inside its burrow until the wasp larva can hatch out and consume its still-living host.

But this is no easy task. First, the wasp must find the well-camouflaged spider residence. A very good sense of smell and observation of possible spider burrows from the air or on the ground (depending on the habits of the particular wasp species) are certainly necessary to the work. Still, considering the area that must be reconnoitered by the wasp to find a spider ensconced in a camouflaged hole in the ground, it is a task that would put many military intelligence workers to shame.

Then the wasp attacks, sometimes merely pulling on alarm-webbing that surrounds the burrow. This will bring the spider out into the open, expecting a ready-made meal. If the wasp is quick enough, it can sting the spider, perhaps in the midsection, before the creature can react. The spiders boast long, deadly (to insects) fangs, dripping with paralyzing poison. The spider may recognize the danger and duck back into its fortress. If it successfully closes the trapdoor, the wasp will be shut out. The spider can hold the door shut with two or four legs, and hold on to its home's wall with the other four. No problem: the wasp merely chews off the door's hinges and comes face-to-face with an angry spider! Then, we have a problem. How will the wasp deal with the spider head-on?

Some wasps have a talent for hypnosis; they appear to stroke the spider with their antennae, putting it into a restive state. In other cases, the wasp merely turns her back on the monster arachnid and stabs it in the head with her formidable stinger—end of combat. However, this is the beginning of a paralyzed end for the spider.

Then, the wasp can lay its egg (or eggs) either on or, for some species, inside the spider. The newly hatched larval wasp proceeds to eat every part of the spider except its vital organs. Leaving the best for last, it finally gnaws its way to freedom, spreads its wings, and flies away to find a mate, eventually to be a second-generation spider-fighter.

Can this relationship between the wasp and spider be explained by Biological Evolution? I think not. We must also add this paradigm to many others: the construction of the mammalian eye, and the function of rods and cones. The need for the brain to turn the upside-down image transmitted to it, right-side up. Then there's the Archerfish (*Toxotes*), which can "shoot" (via spitting jets of water at its insect prey from an underwater perch, compensating easily for the water's refraction even at odd angles). And the Cleaner Wrasse fish (*Lambroides dimidiatus*) that pops into the mouths of large and dangerous predator-fish to clean them of parasites, dead tissue, and even excess mucus. It can service up to 2000 "customers" in a four-hour feeding period, yet they remain uneaten by sometimes hungry patrons visiting the "cleaning station" on the reef.

Indeed, there are hundreds, if not thousands of such stories (each more mysterious than the last) all pointing to

a Creator (certainly not One Who would use a "dog-eat-dog" process like evolution). This Creator has most certainly left His fingerprints on all of His work in the creation as we have come to know it.

And what of the variations that occur in known species, as Darwin himself pointed out in the birds of the Galapagos Islands? Is this "evolution"? Different colors, different beaks, different diets, different sizes and breeding habits—these are all adaptations for their continued survival in a world where "climate change," earthquakes, volcanoes, and man's activities can cause conditions to change. So far, no one has documented Darwin's birds changing into other species or non-avian creatures. This documentation will likely never be done.

Biological Evolution, of whatever description, is a scientific dodge to avoid implying a creation—and the Creator—in their theories and hypotheses. It is a gigantic academic hoax, that in fact has played a major role in political axioms like Nazism, Communism, and Fascism which have resulted in the deaths of hundreds of millions of human beings. I challenge these scientists who insist that it "must be true" to answer the facts presented here or by numerous other critics to give evidence in support of their positions. We seek the truth of the matter, not mere theories, hypotheses, or suppositions. So far, the scientific world has been unable or unwilling to come up with it.

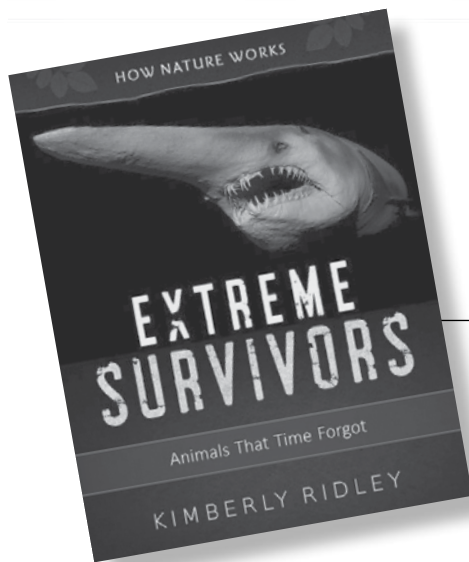
Yours,

Ron Dobbins

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Media Reviews



Extreme Survivors: Animals That Time Forgot

by Kimberly Ridley

Tilbury House, Thomaston,
MA, 2017, 48 pages, \$18.00

Author
Ridley describes
living animals claimed to be hundreds
of millions of years old and, as far as
we can tell from the fossil record, have
not changed. Nearly every page in bold
letters proclaims how many years ago
particular animals evolved: sharks, 125
million; tuatara, 200 million; humans,

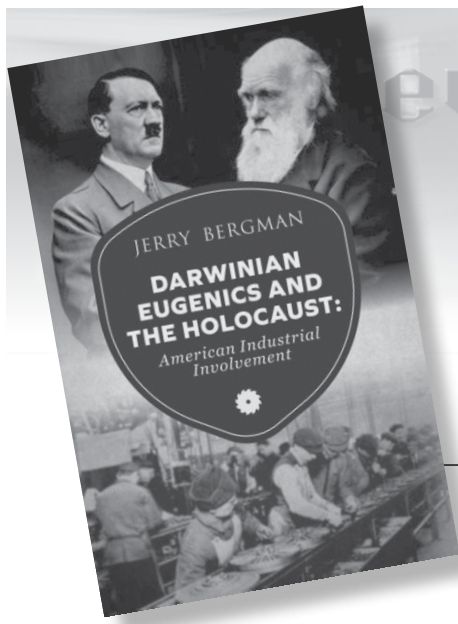
“only for 200,000;” tadpole shrimp, 250
million; lungfish, 300 million; horseshoe
crabs, 445 million; velvet worm, 500
million; tardigrade, 530 million; cham-
bered nautilus, 500 million; and comb
jellyfish, 550 million.

The book includes sections on
Darwin (p. 11), natural selection (pp.
14–15), the idea that dinosaurs evolved
into birds (p. 7), human evolution, and
the long ages of evolution (pp. 40–41).
Ridley adds that life evolved from muta-
tions that better adapt an organism to its
environment. In other words, human

and all other life is the result of billions
of mistakes, most of which are individu-
ally near-neutral but eventually produce
genetic advance.

The book is designed for young
adults; however, the illustrations, mostly
in color, are of general interest. The tar-
digrades, for example, look like robots.
The book focuses on amazing aspects of
science, thus maintaining the reader’s
interest.

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Reviews

Darwinian Eugenics and the Holocaust: American Industrial Involvement

by Jerry Bergman

Involgo Press, Online, 2020,
199 pages, \$23.00

Eugenics is the study of hereditary improvement in the human race by controlled selective breeding. How do you define what is inferior to what is superior? And how are environmental influences contrasted from hereditary conditions? These are some of the questions posed in Jerry Bergman's book. He documents the tragic effect of Darwinian eugenics not only in Nazi Germany, but also in the U.S.

The first step in establishing Darwinian eugenics is to attack the Creation worldview. Darwinian evolution attempts to demonstrate that human beings are not a creation of God but instead are animals, just one part of

nature. With this approach, people may have some unique characteristics but are advanced no more than other species. This thought process was critical in starting the eugenics movement by Darwin's cousin Francis Galton.

Bergman demonstrates that Ernst Haeckel's underlying theme through his books was that the material world is all that exists, and that Darwinism explained it all. The premise of Darwinism was the critical link (i.e., race breeding) that connected the genocide of the Herero people, the Nazi Holocaust, and Rwanda.

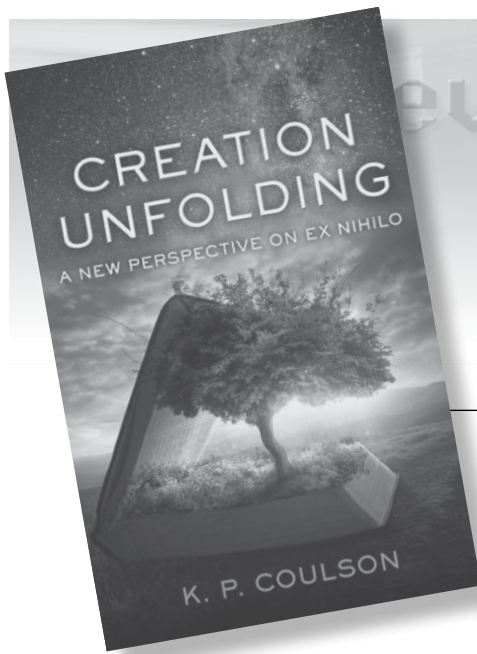
The book covers the history of how Darwin's writings changed America with the introduction of eugenics. Also, H.G. Wells' endorsement of Darwinism in Europe and the U.S. openly advocated

eugenics. Racism has a long history in America and became stronger with the rise of Darwinism.

Bergman demonstrates how eugenics became well established in the American academic community, and also in industry including Ford, GM, Standard Oil, Eastman Kodak, Kellogg Cereal, Andrew Carnegie Institution, John D. Rockefeller Foundation, Coca-Cola Company, Aniline Film, Harriman Railroad Fortune, IBM, and the Human Betterment Foundation.

Bergman's book ends with a warning that eugenics is alive and well today, and we must not to forget the past.

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Creation Unfolding: A New Perspective on Ex Nihilo

by K.P. Coulson

Phaneros Press, Coppell, TX,
2020, 195 pages, \$5.99

This book is a confused, self-contradictory mess with an extraordinarily dangerous theological premise.

Although the author affirms a recent six-day creation, he argues that evidence for creation is ambiguous (p. 9) and that the Earth *really does* look old (pp. 25, 32). Coulson argues that God did this deliberately, as an act of mercy, in order to minimize future punishment of God's enemies (pp. 139–143).

This is terrible theology. If evidence for creation is equivocal, then uniformitarians and evolutionists are in some sense being reasonable (p. 137) when they deny God, despite the fact that the Bible teaches that those who do so are “fools” (Ps. 14:1) and “without excuse” (Rom. 1:20). While God no doubt may withhold additional revelation in order to minimize future condemnation, this basic “natural revelation” is unambiguous, “for God has shown it to them” (Rom. 1:20).

Creationists should be willing to acknowledge when we do not know the answer to a particular question, but this book goes way beyond. It seems to be an attempt to tear down the last six decades of creationist scholarship. The author

discusses geological evidence for watery deposition of the Coconino Sandstone, but then immediately neutralizes his own argument by saying this evidence proves neither a young Earth nor Noah's Flood (p. 125). While technically true, this water-deposited sandstone covers hundreds of thousands of square miles. That certainly implies a Flood that is at least regional in extent. Yet oddly, the author drops the subject with no attempt to present additional evidence that the Flood was global.

Likewise, Coulson writes that there are powerful arguments for a young Earth (p. 10), but he chastises creationists for using them, claiming that focusing on “anomalies” pits “science against science” (p. 108). His own solution to the apparent conflict between secular thinking and the Bible's short chronology is that God used synchronized natural processes to create the universe in six days. However, he states that a uniformitarian could reasonably interpret this synchronized process as having occurred over vast ages (pp. 25, 32, 137–139).

Coulson states that it is inconsistent (p. 78) for creationists to use young-Earth arguments because they do not all yield the same age. He seems to not understand that young-world arguments use uniformitarian assumptions to obtain maximum possible ages. These maximum ages are too young to fit the

evolutionary story, but because they are all greater than 6,000 years, they are consistent, both with one another and with recent creation.

The author does not seem to think much of creationist scholarship to date, but he makes numerous scientific mistakes himself. Coulson confuses changes in the direction of the geomagnetic field with changes in the energy associated with the field itself (pp. 69–70). He thinks dark matter invalidates the spiral galaxy “winding up” argument, glossing over dark matter problems (pp. 108–109). The author mistakenly claims that Saturn's rings require the solar system to be at least ten million years old, when popular-level science articles acknowledge this is an upper age limit (p. 173). Many other misstatements of fact occur—too many to list here.

The author is unduly concerned with resolving “tension” between secular and creation science (p. 8). Although he recognizes the unregenerate mind's hatred toward God (p. 141), he downplays how that hatred can influence the interpretation of scientific data (pp. 3, 5–6), and suggests creationists are “overly suspicious” of secular science. Incredibly, he says death was designed in the mind of God and pre-programmed into our DNA before the Fall occurred (p. 59). He repeatedly suggests, but does not state outright, that stars and planets can form naturally (pp. 2, 25), just not

in six days. Coulson acknowledges that his position stretches the bounds of what is considered orthodox (p. 11).

If this review sounds harsh, it is because the notion that “creation evidence is ambiguous” is arguably just as dangerous as the statement that “a loving God would never send anyone to hell.” If natural revelation really is equivocal, then the evolutionary/uniformitarian position is reasonable, and the author says as much (p. 137). And if it’s reasonable, how can God justly punish sin? In the evolutionary worldview, there is no objective basis for morality, so the sinner

can plausibly claim he had no reason to think he would one day have to give an account to God, or that God even exists. Why then should he “flee the wrath to come” (Luke 3:7)?

Telling a hell-bound sinner that his denial of God is in any way reasonable is one of the cruelest things a Christian can do. It is similar to singing someone to sleep as the flames of a raging fire lick at his door. It lulls the sinner into a dangerous sense of complacency about his need for the gospel.

Based on comments and bibliography citations, the author is influenced

by a particular strain of young-Earth creationism that argues the Earth looks old, but Christians should affirm it is young because the Bible says so. Advocates of this view should consider the effect their teachings have on others. These words come to mind: “But whoever causes one of these little ones who believe in me to stumble, it would be better for him if a millstone were hung around his neck, and he were thrown into the sea” (Mark 9:42).

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Instructions to Authors

Submission

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

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

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

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

Appearance

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

Submitted manuscripts should have the following organizational format:

- 1. Title page.** This page should contain the title of the manuscript, the author's name, and all relevant contact information (including mailing address, telephone number, fax number, and e-mail address). If the manuscript is submitted by multiple authors, one author should serve as the corresponding author, and this should be noted on the title page.
- 2. Abstract page.** This is page 1 of the manuscript, and should contain the article title at the top, followed by the abstract for the article. Abstracts should be between 100 and 250 words in length and present an overview of the material discussed in the article, including all major conclusions. Use of abbreviations and references in the abstract should be avoided. This page should also contain at least five key words appropriate for identifying this article via a computer search.
- 3. Introduction.** The introduction should provide sufficient background information to allow the reader to understand the relevance and significance of the article for creation science.
- 4. Body of the text.** Two types of headings are typically used by the *CRSQ*. A major heading consists of a large font bold print that is centered in column, and is used for each major change of focus or topic. A minor heading consists of a regular font bold print that is flush to the left margin, and is used following a major heading and helps to organize points within each major topic. Do not split words with hyphens, or use all capital letters for any words. Also, do not use bold type, except for headings (italics can be occasionally used to draw distinction to specific words). Italics should not be used for foreign words in common usage, e.g., "et al.," "ibid.," "ca." and "ad infinitum." Previously published literature should be cited using the author's last name(s) and the year of publication (ex. Smith, 2003; Smith and Jones, 2003). If the citation has more than two authors, only the first author's name should appear (ex. Smith et al., 2003). Contributing authors should examine this issue of the *CRSQ* or consult the Society's web site for specific examples as well as a more detailed explanation of manuscript preparation. Frequently-used terms can be abbrevi-

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

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

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

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

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

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

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

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

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

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

8. Figures. All figures cited in the text should be individually placed in numerical order, and placed after the tables. Do

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

Special Sections

Letters to the Editor:

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

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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The membership/subscription categories are defined below:

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All members (categories 1–5 above) must subscribe to the Statement of Belief as defined on the next page.

Please complete the lower portion of this form and mail it with payment to CRS Membership Secretary, 6801 N. Highway 89, Chino Valley, AZ 86323, or fax for credit card payment to (928) 636-1153. Applications may also be completed online at creationresearch.org.

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Creation Research Society

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

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

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

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

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

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

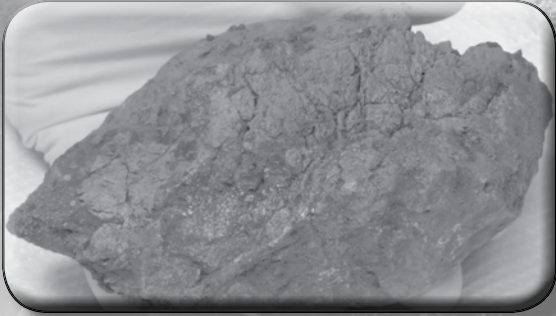
2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.

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

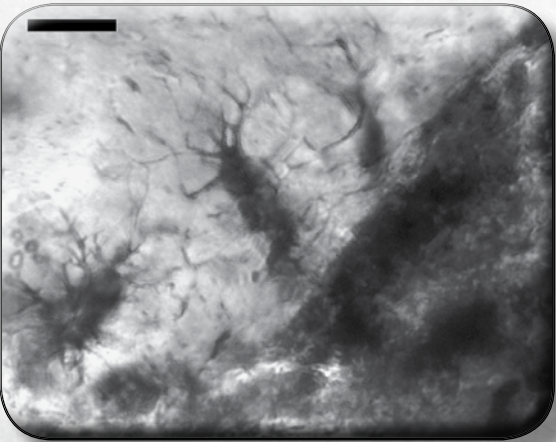
4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Savior. The act of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation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

iDINO II

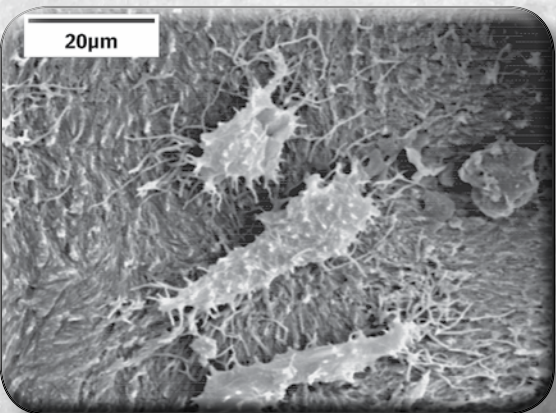
Investigation of Dinosaur Intact Natural Osteo-tissue



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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