

# Creation Matters



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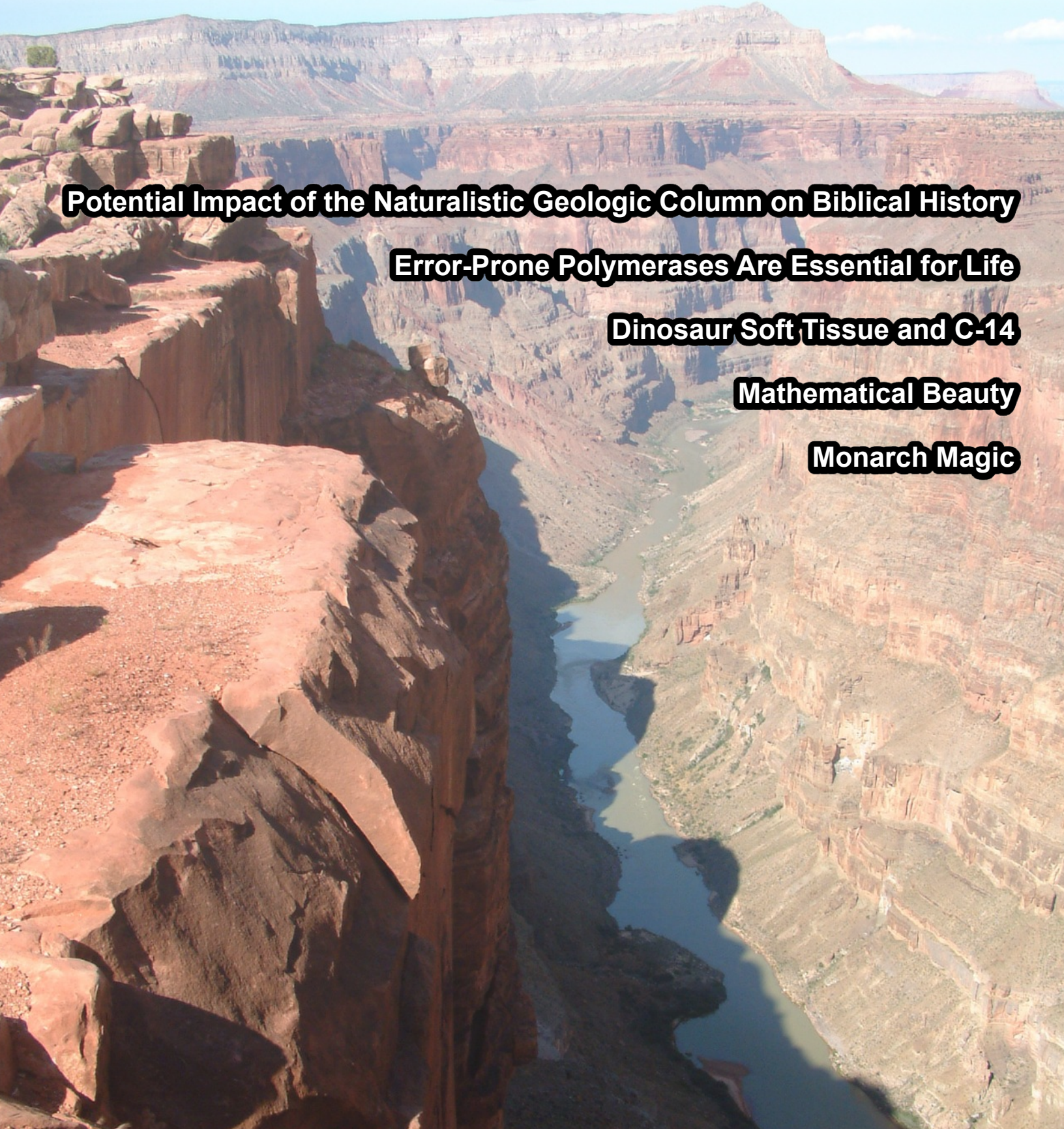
**Potential Impact of the Naturalistic Geologic Column on Biblical History**

**Error-Prone Polymerases Are Essential for Life**

**Dinosaur Soft Tissue and C-14**

**Mathematical Beauty**

**Monarch Magic**







## Mathematical Beauty

Mathematicians see beauty in ways less familiar to many of us. Some people may be repelled by formulas; however, others see elegance in proofs and theorems. Also of special interest are math functions which display symmetry, wide physical application, and connections between diverse mathematical disciplines. One example of the latter is Leonhard Euler's Identity or Euler's Equation,

$$e^{i\pi} + 1 = 0$$

This simple yet comprehensive formula dates from the 1740s. The letter  $e$  is the base of natural logarithms;  $i$  is the imaginary unit standing for  $\sqrt{-1}$ . Also included is  $\pi$ , the ratio of circumference to diameter for a circle, the basic numbers 0 and 1, and the three fundamental math operators: exponential, product, and addition. The proof is left to the reader by rewriting the first term using the general relation

$$e^{ix} = \cos x + i \sin x.$$

Euler's equation has been eloquently described by many mathematicians (Nahin, 2006):

*Euler's equation reaches down into the very depths of existence* (Keith Devlin).

*Exquisite beauty* (Paul Nahin).

*The most famous formula in all mathematics* (Constance Reid).

The subject of beauty and aesthetics usually concerns the arts, and studies have revealed a close connection with



Leonhard Euler, 1707-1783

mathematics. The region of the brain which reacts to music and images by artists is the same part of the brain, the medial orbitofrontal cortex, which is activated when mathematicians perceive beauty in numbers and symbols (Neuman, 2014).

Mankind's perception of beauty, whether mathematical, musical, or visual, may relate to our formation in the image of God. Beauty or perfection is an attribute of the Creator of the universe. We are surrounded by His artwork, including the mathematical framework of creation.

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### Cover photo: Grand Canyon-Parashant National Monument

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### Contents

<b>Math Matters: Mathematical Beauty.....</b>	<b>2</b>
<b>Matters of Fact: Error-Prone Polymerases Are Essential for Life.....</b>	<b>3</b>
<b>...without excuse! The Testimony of Dinosaur Fossil Soft Tissue.....</b>	<b>4</b>
<b>The Potential Impact of the Naturalistic Geologic Column on Biblical History.....</b>	<b>6</b>
<b>Speaking of Science</b>	
Animal Engineers Teach Physics Profs a Thing or Three.....	9
New Earth Ocean Theory Is All Wet.....	10
There's No Place Like Earth.....	10
<b>All by Design: Monarch Magic.....</b>	<b>12</b>

## Creation Matters

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Articles published in *Creation Matters* represent the opinions and beliefs of the authors, and do not necessarily reflect the official position of the CRS.

*Editor's note: You may submit your question to Dr. Jean Lightner at [jean@creationresearch.org](mailto:jean@creationresearch.org). It will not be possible to provide an answer for each question, but she will choose those which have a broad appeal and lend themselves to relatively short answers.*

## **Q Are error-prone polymerases a result of genomic decay since the Fall?**

**A** No. The error prone polymerases are essential for maintaining genomic stability.

### **What is a polymerase?**

A polymerase is an enzyme that forms a strand of DNA or RNA from a previously existing DNA or RNA template. These enzymes are extremely important; life would not exist without them. For example, every time a cell divides it must copy all the nuclear DNA so that each new cell has one copy. This is done with DNA polymerases. Also, throughout life, RNA polymerases are used to copy DNA to make proteins (from mRNA), or various types of RNA regulatory molecules (often grouped under the term noncoding RNAs, or ncRNAs).

### **What are DNA polymerases used for?**

Humans have 17 unique DNA polymerases which can be grouped into three general categories. The A-family polymerases replicate DNA fast and accurately, and thus are sometimes referred to as replicases. However, if there is any damage or mispairing of the bases, or if there is a break in the DNA strand, these polymerases will be immediately stopped. Several other polymerases are required to handle various lesions which can appear in the DNA molecule. There are eight DNA polymerases in the B-family and four in the Y-family that play important roles in a process called translesion repair.

DNA damage, which occurs regularly, can be the result of environmental toxins, radiation, and even various metabolites produced in our own bodies. These events alter the conformation and chemical structure of the DNA molecule, blocking normal replication. It is hypothesized that two special-

ized polymerases are generally involved in overcoming this obstacle. The first deals with the damaged base, while the second extends the primer (the starting point for DNA synthesis) a few more bases so that a replicase can continue the replication process. A Y-family polymerase is commonly used for the first step, and a B-family polymerase for the second (Yang, 2014).

### **A closer look at the Y-family**

The Y-family of DNA polymerases does have a higher error rate when copying normal DNA, and lack the normal proofreading machinery of a replicase. They are tightly

**Without this well-controlled mechanism to change the DNA sequence, we could not mount an effective antibody response...**

regulated so they can be called into action (or "recruited") only at appropriate times. They also work slowly, which helps ensure that they do not remain attached to the DNA for more than a few base pairs. However, they do have the ability to accomplish translesion synthesis (TLS) with good accuracy.

Individual members of this family have different binding sites for the template bases, and different preferences for the incoming nucleotides. This means that certain members are specialized to handle certain types of lesions. The best studied member is DNA polymerase  $\eta$  (Pol  $\eta$ ), which plays a major role in the repair of UV damage. Humans lacking a functional gene for this enzyme suffer from extreme UV sensitivity and an increased risk of skin cancer. This is a variant of the genetic disease known as a xeroderma pigmentosum (Yang, 2014).

The most common lesion from UV radiation is a thymine dimer, where an abnormal double bond forms along the DNA strand between two adjacent thymine residues. Pol  $\eta$  places two adenines opposite this lesion, thus correctly repairing it. For DNA damage by methyl methanesulfonate, polymerase Pol  $\kappa$  is recruited to repair the

damage. This incredible design, which allows for the problem to be diagnosed and an appropriate solution applied, is astounding. The details of what is involved in recruiting the proper enzyme have proved to be far more complex than originally estimated (Saugar et al., 2014).

Rev1 is a third member of the Y-family of polymerases. It is upregulated in response to UV exposure, and UV sensitivity results in its absence. Interestingly, it has a large, non-catalytic region which appears to be involved in regulating other Y-family polymerases. This may be its more prominent role in TLS, rather than its catalytic activity. The fourth member of the Y-family is Pol  $\iota$ . It is uncertain what role this polymerase plays. Mice lacking this enzyme showed no obvious deficits, suggesting that in its absence its role can be compensated for by other enzymes (Yang, 2014).

Error-prone polymerases are most notably susceptible to error when they attach to normal DNA, which is why their use is restricted. In many cases, they can accurately handle the repair of damaged DNA. However, this is not always the result. At times, the repair does not restore the original sequence. In the larger picture, the use of error-prone polymerases in TLS is a major source of mutagenesis (Saugar et al., 2014). This obviously can result in problems.

### **Purposeful introduction of changes**

As serious as mutations can sometimes be, it is important to recognize that they do not all cause problems. On the contrary, controlled genetic changes are essential for life. They are used regularly, for example, within the immune system to effect an antibody response. In several steps which are involved in antibody formation, purposeful genetic changes take place. Pol  $\eta$  has been shown to be involved in at least one of these steps, somatic hypermutation. After a lesion is induced by a specific enzyme, Pol  $\eta$  is recruited to repair the lesion. This, in turn, introduces transition and transversion mutations, some of which help increase the specificity of the antibody for a particular

# Error-Prone Polymerases Are Essential for Life

antigen (Matthews, 2014).

Mutations generated during a normal immune-system response are critical in allowing for adaptive change. Without this well-controlled mechanism to change the DNA sequence, we could not mount an effective antibody response to the many antigens that we are exposed to in our lifetimes. Some creationists have proposed that a similar mechanism may be at work to allow adaptive germline mutations

(Lightner, 2014). While we have much to learn on this topic, what is already known clearly shows that we are fearfully and wonderfully made (Psalm 139:14).

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...without excuse!

by Timothy R. Stout

# THE TESTIMONY OF DINOSAUR FOSSIL SOFT TISSUE

Soft tissue has been found in numerous dinosaur fossils. Realistically, this tissue should have decayed long before these fossils were discovered. More significant than this, many tissue specimens have been found to contain measurable radiocarbon (carbon-14), giving ages of tens of thousands of years. This is inconsistent with evolutionary theory, because the rocks in which these fossils have been found are typically said to be at least 65 million years in age. Given the half-life of radioactive carbon, fossils of such great age should be depleted of all traces of carbon-14.

Evolutionary theory thus faces a serious challenge. As might be expected, the responses by the evolutionists to these findings have been swift and heated.

## The controversy

In 2006, Mary Schweitzer reported her discovery of still-flexible soft tissue from a reputedly 68-million-year-old *T. rex* (Schweitzer et al., 2006). Some of the major television networks reported on this discovery in depth, featuring spectacular video recordings, taken through microscopes, showing the structures in vivid color. A sampling of these dramatic video clips taken from a few of these shows is listed below. Space only permits us to briefly describe what the clips reveal.

[www.youtube.com/watch?v=yJQQi\\_vLFMNY](http://www.youtube.com/watch?v=yJQQi_vLFMNY), produced by “60 Minutes,” the TV news program: News correspondent Leslie Stahl interviews Jack Horner and Mary Schweitzer about their soft-tissue findings. This clip shows very impressive video microscopic views of the tissues.

[www.pbs.org/wgbh/nova/nature/trex-blood.html](http://www.pbs.org/wgbh/nova/nature/trex-blood.html), produced by Nova, a television science program sponsored by PBS, the Public Broadcasting Service: News correspondent Peter Standing interviews a number of paleontologists about dinosaur soft tissue, and provides much insight into what has been found.

[www.youtube.com/watch?v=ynXwAo9VpY](http://www.youtube.com/watch?v=ynXwAo9VpY) produced by cable TV network MSNBC: This is an interview with Schweitzer, a week after her 2006 announcement of finding the dinosaur soft tissue. When asked if it was amazing to find soft tissue in a fossil this old, she responded, “It is very amazing. It is utterly shocking, actually, because it flies in the face of everything we understand about how tissues and cells degrade...A lot of our science doesn’t allow for this.”

In recognition of the significance that fossil soft tissue has on the creation-evolution controversy, the Creation Research Society devoted the entire contents of the Spring, 2015 issue of its peer-reviewed journal, *CRS Quarterly*, to the investigation of this topic. In addition to detailed reports about the CRS’s own iDINO research with actual soft dinosaur tissue (Armitage, 2015; Anderson, 2015), this issue presents a thorough discussion of the current arguments for and against this being young, soft tissue.

The *Quarterly* also contains an excellent article reviewing the current state of radiocarbon dating of dinosaur bones and other materials that are alleged to be millions of years old (Thomas and Nelson, 2015). The specimens cited in this article,

which included seven dinosaur samples, dated from about 18,000 to 50,000 radiocarbon years.

## Censorship

At an international geophysics conference held in Singapore in 2012, the Paleochronology Group, an independent, creation-friendly organization, presented their results of carbon-14 dating for several dinosaur specimens. Estimated ages were 22,000 to 39,000 years. Following the conference, the program chairman, in a letter to the researchers, dismissed their results as “obviously an error,” and rescinded the abstract from the conference proceedings. A copy of the letter is reproduced by Fischer (2015).

An article published in *Discovery Magazine* in 2006 clearly illustrates the hostility shown by evolutionists in response to Schweitzer’s discovery (Yeoman, 2006):

‘The most likely source of these proteins is the once-living cells of the dinosaur,’ she [Schweitzer] wrote in a 1997 paper... That article, published in Proceedings of the National Academy of Sciences [Schweitzer et al., 1997], sparked a small flurry of headlines... Opponents say, ‘I just don’t believe it.’ She was having a hard time publishing in journals.

Jeffrey Bada, an organic geochemist at the Scripps Institution of Oceanography in San Diego, cannot imagine soft tissue surviving millions of years. He says the cellular material Schweitzer found must be contamination from outside sources ... radiation would have degraded its body. Bada says: “Bones absorb uranium

and thorium like crazy. You've got an internal dose that will wipe out biomolecules.

She [Schweitzer] acknowledged that one reviewer told her, 'he didn't care what the data said; he knew that what I was finding wasn't possible.' I wrote back and said, 'Well, what data would convince you?' And he said, 'None.'

The last paragraph of the above quotations was actually removed from the online version of the *Discover* article. It should be noted that while Schweitzer believes that the soft tissue findings are real, she does not accept the young-age implications.

## What it all means

The evidence we have examined points to one conclusion: these tissues are of very recent origin, not one of 65 or more million years. One advantage of all of the hostility by the evolutionists is that despite an intense effort to debunk the findings, they have not been successful at any point. As a result, it is clearer than ever that the tissues are truly of recent origin.

The main argument against these findings at one point was that the soft tissue was comprised of "bacterial slime (biofilm)." That has been shown not to be the case because, among other things, the tissues contain animal collagen, which differs from

a collagen-like protein formed by bacteria (Anderson, 2015). More recent efforts to question the data have centered on mechanisms to preserve the tissue for millions of years, including smectite adhesion, apatite sequestration, and iron adhesion, all of which have been shown to be inadequate. The interested reader is referred to the *CRS Quarterly* special iDINO issue mentioned earlier (see especially Thomas, 2015). Likewise, efforts to debunk the carbon-14 dating results have been unsuccessful (Thomas and Nelson, 2015).

After a while, continuing to deny the obvious becomes futile. The Bible speaks in 2 Peter 3 of mockers who are willfully ignorant of the evidence God has provided concerning the testimony of the great flood in the days of Noah. In Romans 1:18–20, the Bible talks about those who are without excuse for suppressing the truth that the creation reveals a living, personal God. As one considers these Biblical passages, it is amazing how accurately they describe the response of today's mockers concerning the testimony of dinosaur soft tissue.

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*CRSQ* = *Creation Research Society Quarterly*

Note: All "You Tube" videos were tested and active on November 29, 2015.

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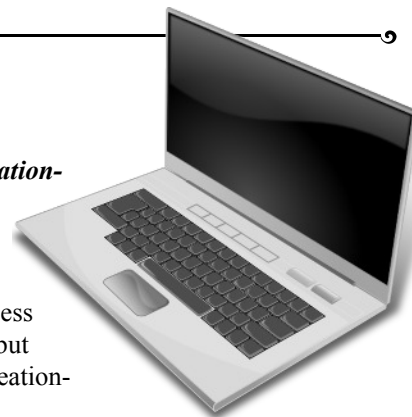
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## What Are Creationists Thinking about ...?

*As new scientific discoveries make the headlines, have you ever wondered how your fellow creationists are reacting? Have you ever thought of a "crazy" new idea about origins and wanted to bounce it off another creationist?*

Now you can keep in contact daily with creationists from all around the world. The Creation Research Society sponsors **CRSnet**, an online community of CRS members who have e-mail access to the Internet. Not only do participants discuss the latest scientific findings related to origins, but they also receive news about the CRS — its research, publications, and activities — and other creation-related news.

For more information, send an e-mail message to Glen Wolfrom at [contact@creationresearch.org](mailto:contact@creationresearch.org).  
*Participation is limited to CRS members in good standing.*





# The Potential Impact of the Naturalistic Geologic Column on Biblical History

by Carl Froede, Jr. and A. Jerry Akridge

*Editor's note: The editor is aware of the controversial nature of this article. Our intention is to bring these issues to the attention of those who might like to contribute to the dialog. The CRS has taken no official position on the utility of the various geologic models.*

Naturalists have long advocated their worldview through application of the standard geologic timescale/column (Figure 1). Many young-earth creationists have also sought to adopt this same philosophical framework in developing a Bible-based Earth history (see sidebar **Telling Time**). We contend that this approach creates more problems than provides answers (Reed and Froede, 2003; Froede and Akridge, 2013).

In this article we examine two of the leading young-earth creationist concepts which have been developed from the naturalistic geologic column, 1) Catastrophic Plate Tectonics, and 2) Stratigraphic Megasequences, to determine if they present a

unified chronology of biblical history, or possibly create conceptual and chronological uncertainty. We report our analysis and briefly review biblically-based alternatives.

## Catastrophic Plate Tectonics

Catastrophic Plate Tectonics (CPT) was proposed in 1994 by several young-earth creationists to link the geophysics of Plate Tectonic Theory to the Flood of Genesis (Austin et al., 1994). Despite its broad acceptance by creationists, this concept has not gone without challenge due to its many potential problems in biblical application (Reed et al., 1996b; Froede, 1998, 2001, 2002, 2007b; Akridge et al., 2007; Froede et al., 2014).

Originally, CPT linked the onset of the global Flood to the breakup of the Pangean Supercontinent (Baumgardner, 1986, 1990, 1994a, 1994b). This created problems with defining fossilized animals in Precambrian and lower Paleozoic strata **before** the Flood (Reed and Froede, 2002). Recently, the framework of CPT was extended further back in time, claiming Flood initiation with the breakup of the Precambrian Rodinian Supercontinent (Snelling, 2014).

In this latest scenario, the onset of the Flood resulted in the various continental landmasses having drifted apart for unknown distances, only to converge again to form the submerged Pangean Supercontinent. The eventual breakup of Pangea and resulting continental landmass separation continued during the Flood, eventually ending with the cessation of broad-scale continental movement and with the continents at or near their present positions following the withdrawal of Floodwater.

The naturalistic geologic column provides the conceptual framework for this biblical reinterpretation of Plate Tectonic Theory (Figure 1).

## Sloss Sequences and Diluvial Megasequences

The adoption of naturalistic Sloss stratigraphic sequences (Sloss et al., 1949; Sloss, 1963, 1964, 1988) was first proposed in 1994 (Austin and Wise, 1994). While creationists renamed “sequences” to “megasequences,” nothing conceptually changed in application to its tenets. The concept has remained undeveloped until recently. In its current revival, creationist megasequences are interpreted in support of the Genesis Flood (Snelling, 2009; Morris and Johnson, 2012; Clarey, 2014, 2015a, 2015b; and Clarey et al., 2014). However, many of the concepts applied in following the megasequence approach have been challenged in the development of a biblical geologic framework (Froede et al., 2015).

Clarey (2015a), a young-earth creationist, outlines the Sloss stratigraphic sequence conceptual model as:

The main area of interest concerns the six megasequences that comprise most of the fossil-bearing strata on Earth. Megasequences are defined as packages of sedimentary rock bounded top and bottom by erosional surfaces, with coarse sandstone layers at the bottom (deposited first), followed by shales, and then limestone at the top (deposited last). ...According to secular geologists, subsequent megasequences are supposed to demonstrate a pattern of sandstone-to-shale-to-limestone deposition as sea levels repetitively rose and fell over millions of years, flooding the North American continent up to six separate times. The upper erosional boundaries were supposedly created as each new megasequence advanced across the land and eroded the top of the earlier sequence.

Differentiating this naturalistic approach from one consistent with Flood geology, Clarey (2015a) states:

In the Flood model, variations in the sequence-bounding rock types make perfect sense. Flood geologists don't expect the ocean to completely drain off the continent and drop to previous sea levels between each megasequence.

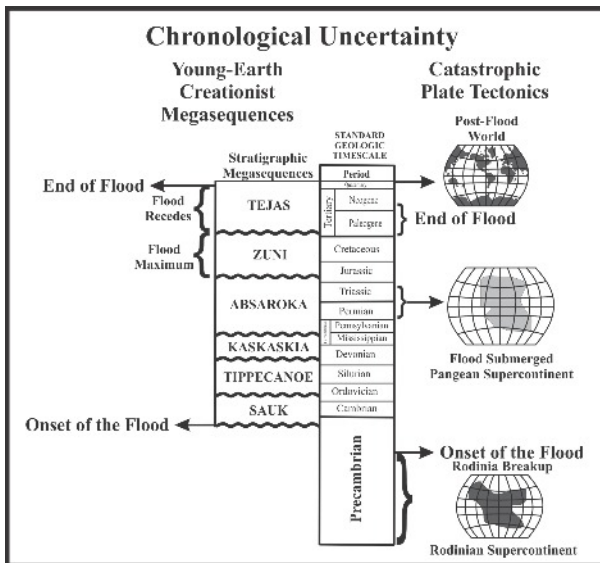


Figure 1. The standard geologic timescale/column is used to define Earth history within the philosophical construct of Naturalism. Advocates of Catastrophic Plate Tectonics (CPT) and Stratigraphic Megasequences both use it absent deep time and evolution, but not without unintended consequences. Advocates of CPT invoke the breakup of Rodinia as occurring at the beginning of the Flood. Compare that history to the six stratigraphic megasequences. Note that in both conceptual frameworks, the sequential arrangement of strata still relies on uniformitarian and evolutionary ideas (Reed, 2008). Modified from Sloss (1964, Figure 2) and Froede, et al. (2014, Figure 1).

equence. The Bible says:

The waters prevailed and greatly increased on the earth, and the ark moved about on the surface of the waters. And the waters prevailed exceedingly on the earth, and all the high hills under the whole heaven were covered. (Genesis 7:18–19).

The actual rock layers confirm this exact series of events. The megasequences show that the floodwaters seemed to rise somewhat steadily across the continent. The waters may have dropped between megasequences but may not have drained completely off the land. The variations in observed rock types at different locations and sequence boundaries merely reflect the local conditions during the one continuous Flood event.

The naturalistic geologic column forms the framework for this biblical reinterpretation of Sloss' stratigraphic sequences (Figure 1).

### Chronological consistency or uncertainty?

A simple test in adapting the naturalistic geologic column to biblical history would be reinforced through chronological consistency between concepts like CPT and Stratigraphic Megasequences. The onset of the Flood should have the same position within the column, and the end of the Flood as well. However, Figure 1 shows chronological inconsistency between these popular creationist concepts. They are mutually exclusive and cannot be unified by the datasets (based in naturalism) used to support them. Differences between these two concepts, as tied to the naturalistic geologic timescale/column, create uncertainty in defining a singular biblical history.

### A Bible-based geologic timescale and stratigraphic column

Young-earth creationists are not required to follow the naturalistic geologic timescale/column in developing a biblical geologic framework. Two Bible-based geologic timescales/columns have already been proposed (Walker, 1994; Froede, 1995). Both have been vetted through creationist technical review and have been applied at many different locations (e.g., Walker, 1996; Froede and Reed, 1999; Froede, 2005, 2006; Oard and Froede, 2008; Froede, 2011).

These biblically-aligned geologic

timescales/columns provide a means of examining sediments, rocks, and fossils in a manner that allows for direct and consistent application to the Bible (Figure 2 illustrates one such column). Each approach offers a template that will need to be applied to each outcrop, basin, and region. Only then can young-earth creationists gain the insight necessary to possibly link local, regional, or even continental-scale unconformities, lithologic similarities, and depositional packages to biblical history.

### Discussion/conclusions

Geologic models are important conceptual devices in developing ideas. However, when derived from Naturalism, they can carry unnecessary philosophical baggage, and typically require special conditions in adapting them to a technical understanding of diluvial geology (Figure 1). It is our studied opinion that neither Catastrophic Plate Tectonics nor Creationist Megasequences are logically able to smoothly integrate biblical history with the standard geologic timescale/column. Both result in different "biblical" chronologies.

The development of Earth's geologic history should occur through a biblical geologic framework (Figure 2). Each proposed geologic framework should be thoroughly vetted within the young-earth creationist technical community before being presented to laity as appropriate models in defining biblical history. We therefore encourage the advocates of Catastrophic Plate Tectonics and Stratigraphic Megasequences to address the technical and biblical conceptual concerns for each of these concepts (see references) before continuing with model development. The goal in this work is to bring God glory and honor as we all work together in the development of a biblical geologic framework of Earth history.

### Acknowledgments

We are grateful for the kind assistance received from Dr. Glen Wolfrom, an anonymous reviewer, and Dr. J.K. Reed. We appreciate the support we re-

ceive from our spouses in our research and writing efforts. Any errors that may remain are our own. Glory to God in the highest! Proverbs 3:5–6.

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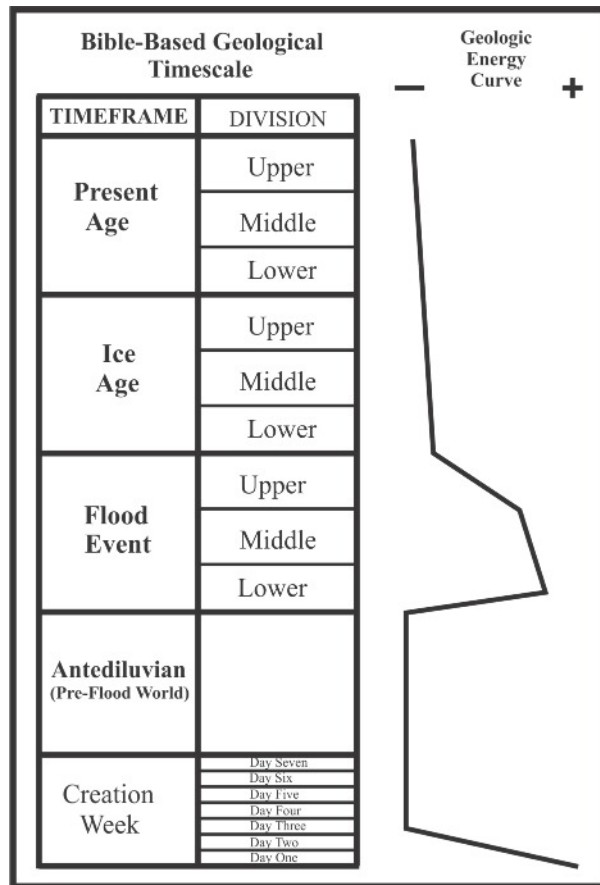


Figure 2. This is one of the Bible-based geological timescales that can be used to define the stratigraphic record consistent with Scripture (Froede, 1995, 2007a). The geological divisions do not correspond to the naturalistic geological timescale/column and require investigation of the actual rock record. The geologic energy column shows the expenditure of large-scale geologic processes such as tectonism, volcanism, erosion, transport, and sedimentation throughout biblical history (modified from Reed et al., 1996a). Such forces operated at highest levels on Day 3 and during the global Flood.

## Telling Time

For many years, young-earth creationists have misunderstood the conceptual naturalistic “Standard Geologic Timescale/Column.” Many have the mistaken assumption that simply removing the millions of years from the timescale can leave creationists with an acceptable “timeless” geologic column from which to define biblical history. Unfortunately, that idea is simply false (see Chapter 2 in Reed, 2013, and Chapter 3 in Reed et al., 2006a). The geologic timescale and geologic column are holistically linked and synonymous and are bound to specific time constraints (i.e., chronology). This can be demonstrated from the *Glossary of Geology*:

**geologic time scale** An arbitrary chronologic arrangement or sequence of geologic events, used as a measure of the relative or absolute duration or age of any part of geologic time, and usually presented in the form of a chart showing the names of the various rock-stratigraphic, time-stratigraphic, or geologic-time units, as currently understood (Neuendorf, et al., 2005, p. 267).

**geologic column** (a) A composite diagram that shows in a single column the subdivisions of part or all of geologic time or the sequence of stratigraphic units of a given *locality or region* (the oldest at the bottom and the youngest at the top, with dips adjusted to the horizontal) so arranged as to indicate their relations to the subdivisions of geologic time and their relative positions to each other. See also: columnar section. (b) *The vertical or chronologic arrangement or sequence of rock units portrayed in a geologic column* (Neuendorf, et al., 2005, p. 266). [Italics added]

The first definition of the term “geologic column” is in reference to a local-to-regional scale vertical section, while the second definition is the usual global use of that term. By definition, each of the two terms is used in chronological application. The corresponding subdivided “Periods” of time cannot be eliminated or rearranged. It should be apparent that simply adopting this naturalistic geologic framework creates internal inconsistencies in defining a biblical geologic history due to the foundational tenets of Naturalism (e.g., evolution, radiometric dating, and the presumed former paleoenvironments spanning millions of years — see Chapter 8 in Reed et al., 2006b).

While we are against its use, should young-earth creationists choose to follow the standard geologic column to define biblical geologic history, it must then result in chronological consensus. For example, there was only one beginning to the Flood, and that boundary should be consistent in the standard geologic column. Differences between creationist models when applied to the column indicate serious problems that must be resolved (e.g., Which model is correct? Why are there differences?).

Presently, two of the popular creationist models (e.g., CPT and Megasequences — Figure 1) have conflicting geologic column chronologies, and these differences remain unresolved. These two models offer two different locations in the geologic column for the start of the Flood, which implies that the Flood began at two different places in the rock record. Its ending at many more places in the column suggests even more confusion in defining the end of the Flood from the rock record as seen in the geologic column.

— C.F. and J.A

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# Speaking of Science

## from the Creation-Evolution Headlines

by David F. Coppedge

*Editor's note: These S.O.S. (Speaking of Science) items have been selected from "Creation-Evolution Headlines" by David F. Coppedge at <http://crev.info> and are used by permission. Unless otherwise noted, emphasis is added in all quotes.*

### Animal Engineers Teach Physics Profs a Thing or Three

Three animals never went to the university, but they leave human PhDs struggling to catch up to their know-how.

#### Electrical engineers—electric eels:

These doctorates in electrical engineering have mastered the fine-tuning of shock waves. "The high voltage discharge generated by electric eels is a powerful predatory weapon," *Current Biology* says.<sup>1</sup> "A new study shows that eels exploit basic physics to increase the voltage delivered to prey, inducing muscle fatigue that turns challenging prey items into easy targets." The eels bend their bodies to deliver a double wallop, and their discharges are finely tuned to "remotely activate prey motor neurons, resulting in whole-body muscle contractions that cause temporary immobilization." This is "a remarkable example of animal behavior exploiting physics of the natural world," the authors remark. "Despite longstanding fascination with these creatures, we are just beginning to understand exactly how this weaponry works to subdue prey."

**Optical and cryptographic engineers—mantis shrimp:** We've seen these little engineers before. They're known for their 10,000-g hammerlike fist blows<sup>2</sup> and weird eyes that can detect circularly polarized light.<sup>3</sup> Now we see them using that light for encrypted communication, a type of steganography or "hiding in plain sight." [See also All by Design in *Creation Matters* 20(1) and 20(2)] Researchers publishing in *Current Biology* say,

Animals that communicate using conspicuous body patterns face a **trade-off** between desired detection by **intended receivers** and undesired detection from **eavesdropping predators**, prey, rivals, or parasites. In some cases, this trade-off favors the evolution of signals that are both **hidden**



from predators and visible to conspecifics. Animals may produce covert signals using a property of light that is invisible to those that they wish to evade, **allowing them to hide in plain sight** (e.g., dragonfish can see their own, otherwise rare, red bioluminescence). The use of the **polarization of light** is a good example of a potentially **covert communication channel**, as very few vertebrates are known to use polarization for object-based vision. **However, even these patterns are vulnerable to eavesdroppers**, as sensitivity to the **linearly polarized** component of light is widespread among invertebrates due to their intrinsically polarization-sensitive photoreceptors.

**Stomatopod crustaceans appear to have gone one step further** in this arms race and have evolved a **sensitivity to the circular polarization** of light, along with body patterns producing it. However, to date we have no direct evidence that any of these marine crustaceans **use this modality to communicate with conspecifics**. We therefore investigated circular polarization vision of the mantis shrimp *Gonodactylaceus falcatus* and demonstrate that (1) the species **produces strongly circularly polarized body patterns**, (2) they **discriminate** the circular polarization of light, and (3) that they **use circular polarization information to avoid occupied burrows when seeking a refuge**.<sup>4</sup>

#### Aeronautical engineers—bats:

Could you land a plane upside down? Imagine a stuntman wearing a wingsuit, flying into a cave and swooping up to hang from the ceiling. Bats do it routinely. A new study reported on *ScienceDaily* figured out how they perform this "**aerobatic feat unlike anything else in the animal world**."<sup>5</sup> First, the bats have to be built right. It's "the extra mass in bats' beefy wings that makes the maneuver possible." But that's not enough. They need to manipulate the wings correctly. Using high-speed cameras to film trained bats, researchers found that the bats use inertia to their advantage. They retract their wings ever so slightly on approach, and rotate a half turn as they land. These little bats taught PhDs at Brown University a "counterintuitive" principle about flight they didn't know. Now, the students want to see if they can get it to work on flying robots.



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## New Earth Ocean Theory Is All Wet

Time to rewrite the textbooks again. Earth started out wet, scientists now claim, overturning decades of dogma.

“Earth may have kept its own water rather than getting it from asteroids,” reads a story title in *Science Magazine*,<sup>1</sup> a summary of a paper in *Science*.<sup>2</sup> The authors concluded, from divination of lavas on Baffin Island collected in 1985 (*Astrobiology Magazine*<sup>3</sup>), that the mantle must have gained its water directly from the protoplanetary nebula.

Astronomers had been telling the public for many years that Earth started out dry and got its water from comets. When the deuterium ratio of comet ice turned out to be too high, they had a problem.

Now, however, instead of apologizing for their mistake, they are bragging that the discovery is “exciting” and suggests that habitable planets may be much more common throughout the universe. For *Science Magazine*, Julia Rosen writes,

In the **prevailing model of an initially dry Earth**, hydrating the planet seemed like “more of a **one-off event**,” Hallis says. However, if the planet **managed to keep water from the solar nebula** before it evaporated away, there’s **no reason other planets couldn’t do the same thing**. Hallis says that her results could mean that **water-rich planets like Earth are not so rare after all**.

*LiveScience* joins this chorus, claiming “the study **could** also have **far-reaching implications** for deciphering where water came from — and how it was lost over time — on other planets in the solar system, and even on planets orbiting distant stars.”<sup>4</sup>

The new theory messes up old beliefs, Rosen indicates, that bits of meteoric rock called carbonaceous chondrites had brought water to the Earth. It also violates tradition that the dust disk was too hot at Earth’s radius to hold any water. To get around that objection, they had to get sneaky:

**Traditionally**, the main **objection** to this idea has been that the **inner portion of the protosolar nebula**, where Earth formed, would have been **too hot** for water to hang around. But Hallis’s team suggests that water floating around in the nebula **snuck** into our nascent planet by adsorbing to dust particles. They cite previous modeling work suggesting that this mechanism **could** allow a significant amount of water **to survive the brutal temperatures and violent processes** by which dust particles coalesced to form planets.

The paper admits that temperatures in the habitable zone would have been 440 to 1340 degrees Kelvin. Those water molecules

would have needed a tight grip to hang on to the dust. Maybe they “snuck” onto the back side of the grains to avoid the solar wind.

The researchers merely assumed that these dust grains would clump into planetesimals and then planets. They spoke of Earth’s accretion six times in the short paper without explaining how tiny dust grains accrete, which they usually don’t. And there’s another problem keeping the traditionalists clinging to their traditions:

However, **some scientists aren’t ready to abandon** the asteroid hypothesis **just yet**. That’s because, on top of bringing water, they are also believed to have **delivered much of Earth’s so-called volatile elements**, namely, carbon, nitrogen, and noble gases, says Conel Alexander, a cosmochemist at the Carnegie Institution for Science in Washington, D.C. To explain the abundance of these elements, **there would have had to have been** enough impacts to also deliver Earth’s water, he says. “That still seems to me the simplest and most **attractive** explanation.”

Ciesla says that the new results **will force scientists to re-evaluate** the process of Earth’s formation. **Perhaps** the team’s adsorption model is correct, or **perhaps** water came to Earth aboard **a kind of asteroid that hasn’t yet been found**, or **that no longer exists** because it all went into making the Earth. “What we have to do is try to understand what fits and what doesn’t,” he says.

The perhapsimaybecouldness index of all these articles is non-trivial. Of special note is the appeal to what “would have had to have been,” that uses the verb *have* three times in six words. It also seems a bit unscientific to appeal to entities that have never been found or no longer exist.

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## There’s No Place Like Earth

A survey of known exoplanets finds no real estate as valuable as Earth.

The most Earth-like exoplanet has come under fire. “**Radiation blasts leave most Earth-like planets uninhabitable**,” *ScienceDaily*<sup>1</sup> says of Kepler 438b, thought before now to be an Earth twin. “Energy released by each **superflare** equivalent to **100 billion megatons of TNT**.” Its real estate value just plummeted. “Regularly occurring every few hundred days, the superflares are approximately 10 times more powerful than those ever recorded on the sun,” the article says. HPF 438 required, but too late; the star’s activity has likely stripped off the planet’s atmosphere. That’s a nasty habit of red dwarfs like Kepler 438b’s angry parent.

Maybe relocating to a neighborhood around a sun-like star would help. Not for a star announced by *PhysOrg*<sup>2</sup>, though: The

“hot Jupiter around a sun-like star” would likely fling any Earth-like exoplanet into outer darkness.

On *The Conversation*,<sup>3</sup> Andrew Norton of The Open University analyzes “**The five most Earth-like exoplanets (so far)**.” Number 1 on his list is Kepler 438b, but we can cross off that overcooked one. (2) Gliese 667Cc is likely on the same barbie, orbiting a red dwarf in a triple star system. (3) Kepler 442b is in a nicer neighborhood, but it is probably over twice the mass of Earth and orbits a cooler star. Those factors tend to have ripple effects. (4) Kepler 62e and 62f are over 30 times the mass of Earth, even though they exist in the star’s habitable zone. (5) Kepler 452b seems more congenial, possibly 1.6 times the radius of Earth (though estimated 5 times the mass), with temperature from –4°F to 50° F. Despite these close calls, Norton is not optimistic about these, or any of the first 1,978 exoplanets examined so far.

As we have seen, **even the most Earth-like of these planets may not be able to support life** due to the **activity of its star**, which can be very different to our sun. Others have a **size** or **temperature** that is slightly on the **extreme** side.

Planet-hunting is still in the early stages, however. There are thousands more “candidate” exoplanets, and more are bound to be identified by upcoming spacecraft. An infographic posted by Alexandra Witze for *Nature*<sup>4</sup> shows the range of exoplanets by size, orbital period, and radius, giving some indication of how likely they are to be habitable. A couple of dozen exoplanets fall in the Goldilocks zone (possibly just right for water), but the whole suite of habitability factors must be taken into consideration: obliquity, eccentricity, potential for superflares from its star, magnetic field, atmosphere, and much more.<sup>5</sup> For the time being, Earth remains uniquely suitable not only for life, but for complex life, ecosystems and civilizations of sentient beings.

## Planet Formation

Do scientists know how planets form? The media are buzzing about a possible planet forming before our eyes. “First photo of **planet in making** captured,” *PhysOrg*<sup>6</sup> announces. “**Planet formation caught in the act**,” Sid Perkins writes for *Science*.<sup>7</sup> “**Growing planet brought to light**,” *Nature*<sup>8</sup> boasts. That’s a lot of hype over some hydrogen-alpha spectral lines coming from a “protoplanet candidate” named LkCa 15. But gaps in dust disks do not always signal the presence of planets, *Astrobiology Magazine*<sup>9</sup> warns.

If you look at the picture, there’s a whole lot of interpreting going on. According to the paper in *Nature*<sup>10</sup>, hot hydrogen gas (10,000 Kelvins) appears to be “falling deep into the potential well of an accreting protoplanet,” according to the Editors, showing the “unambiguous formation of a planet” — the first out of all the exoplanets known so far. Despite their confidence that the H-alpha and infrared data “show that we are unambiguously witnessing planet formation,” and their trust in accretion theory,\* they are not able to say for sure whether the observed infalling gas (if that’s what’s happening) is steady or stochastic. At best, multiple giant planets are involved—nothing Earthlike.

\*They are not witnessing accretion. “Attempts to observe directly signatures of accretion onto protoplanets have hitherto proven unsuccessful,” they admit, and they merely state that the

H-alpha and infrared data are “best explained” by “an accretion disk model.”

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## All by Design

by Jonathan C. O'Quinn, D.P.M., M.S.

Enzymes are specialized proteins that make more efficient, or catalyze, chemical reactions in living organisms. Milkweed plants contain toxins called “cardenolides,” which, when they enter the bloodstream of most animals, inactivate a specific sodium-potassium pump-associated enzyme, making the plants poisonous.

Enter two butterflies of the *Danaus* genus, Monarch and Queen butterflies. These creatures possess an extraordinary ability, the ability for their caterpillars to eat milkweed plants without being killed in the process. You see, these caterpillars possess specially adapted sodium-potassium pump enzymes that are resistant to these toxins. It allows them to accumulate large quantities of the cardenolides within their bodies, making them and their adult butterfly forms poisonous to the many birds that would otherwise like to eat them.

By the way, there is another species of caterpillar, of the Common Crow butterfly, that can also eat milkweed, but it does not possess special enzymes to combat the tox-



G. Wolf from

ins; it is able to excrete the toxin rapidly without its entering the bloodstream (thus these caterpillars are not able to store the toxins for self-defense).

It has been shown that Monarch and Queen butterfly caterpillars consume milkweed at the same rate as the Common Crows, and not more. Thus, the cardenolide-resistant enzyme was concluded to be present to provide Monarch and Queen butterflies with a form of self-defense from birds.

## Monarch Magic

How did these insects acquire such unique defense mechanisms? Were they eating milkweed prior to acquiring the modified form of the enzyme or the ability to excrete the toxin without absorbing it? If so, how would they have survived? Or, did the *Danaus* species possess the adaptive form of this enzyme before they “discovered” that they could eat milkweed? Either way, this specialized relationship was not formed by accident, but required incredible design.

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