Creation Matters

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Historical Geology's Virtual Past

by John K. Reed, PhD and Peter Klevberg

Until recently, philosophizing about geology was done by geologists (e.g., Simpson, Gould, Dott), but philosophers of science have begun to examine geology, providing more of a looking-in-from-outside perspective (e.g., Cleland, 2013; Tucker, 2004; Turner, 2013). In doing so, Gadi Kravitz (2013) has provided an interesting twist, recognizing a profound weakness in historical geology:

> In other words, in spite of the fact that the past is not accessible to direct geological research, geologists believe in its existence, in its independence on the thought process of the geologist, and in his or her ability to understand it as it actually existed…. (Kravitz, 2013, p. 20)

Geologists have ignored these problems because "Geologists usually accept this approach and regard it as intuitive and obvious" (p. 20). As a philosopher, Kravitz (2013) sees it differently:

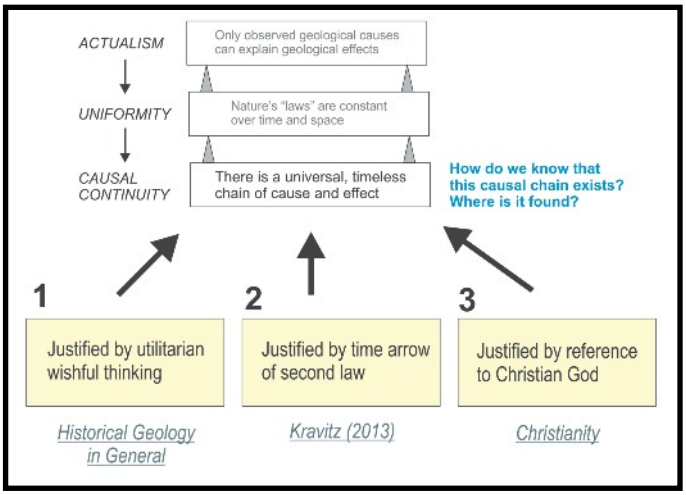

FIGURE 1. Justifying the linked series of actualism, uniformity, and causality is best done by Christianity. Kravitz (2013) offers a better solution than historical geology, but it is logically flawed and inferior to the theological answer of Christianity. Modified from Reed (2011).

> On the face of it, this worldview is intuitive, naïve, and well-adjusted to common sense…. However, closer examination reveals its metaphysical aspect, and the difficulty to realize it in the framework of geohistorical reasoning. The main difficulty lies in the facts that the past is inaccessible and independent, and that there is no necessary logical connection between the past and the present…. If the objects of geological inquiry are cognitively independent, is it at all possible to know them? On the other hand, if it is possible to know them, how can one argue that they are independent? (Kravitz, 2013, pp. 20-21)

This is nothing less than a secular philosopher pulling down the curtain on the

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Neglecting God's Other Book?

by Jerry Bergman, PhD

When was the last time your minister, pastor, or rabbi gave a sermon on a science-related topic? Probably never, if you attend the typical churches or synagogues today. The so-called people of the Book (Christians and Jews) all generally accept that the original manuscripts of the book known today as the Holy Bible were inspired by God. Although some Christians and Jews believe the Bible that we have today was corrupted in translation, all formally hold to it as a book that is worthy of detailed, in-depth study and research.

Many are unaware that Christians, Jews, and even Muslims have historically taught that God has given his people two sources of wisdom: His word the Bible, and His word the book of nature (Rusbult, 2004). Bishop (2013, p.12) explained that the

> … two books metaphor—creation and the Bible are two different books whose ultimate source is God—also has a long history, going back at least as far as Origen of Alexandria. Although theologians tended to view the book of nature as a source of general revelation about God, natural philosophers tended to argue that the book of nature also revealed the workings of creation.

The "two books" teaching

The "two books" metaphor has its "roots deep in antiquity" (Hess, 2002, p. 42). Price (1911, p. 9) called these two books "the two great revelations which the creator has given us of himself." Murphy (2006, p. 64) wrote that the "two books" metaphor

> … has often been used in discussions about the possibility of knowledge of God. The idea is that there are two sources for such knowledge, the book of God's works—nature—and the book of God's words—the Bible. There is a natural knowledge of God which can be gained from observa-

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God's Other Book

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> tion of, and thought about, created things, and there is a revealed knowledge that comes from special disclosures of God in history. These can lead, in turn, to natural theology and theology based upon revelation.

It is for this reason that for centuries clergy were required to study science as part of their seminary training. This is also why many scientists were, until very recently, trained as clergy and became scientists only later in their careers. Examples include not only evolution's popularizer, Charles Darwin, but also the prominent geologist Rev. Adam Segwick, "who interpreted all sciences as aids to religion," and Rev. John Henslow, Regius Professor of Botany at Cambridge University, who devoted his life to observing nature for evidence of God's handiwork in order to gain knowledge about the Creator. Historian Kenneth Howell (2002, p. 1) wrote that the major science figures in early modern Europe "believed that God could be known in both nature and the Bible." Bishop (2013) noted that Galileo is one of the most well-known proponents of the two-books view:

> [Galileo] … argued that the book of nature was written in the language of mathematics and revealed the nature of creation. Galileo gave voice to the growing application of mathematics to all areas of natural philosophy of the sixteenth and seventeenth centuries: To properly read or understand creation's processes, laws, and so forth, requires quantifying them so as to understand as accurately as possible their created natures given by God.

Another example is Johanus Kepler who, in a letter dated March 26, 1598, wrote "astronomers are priests of the highest God in regard to the book of nature." According to Bishop (2013):

> … we are bound to think of the praise of God and not of the glory of our own capacities… Those laws are within the grasp of the human mind; God wanted us to recognize them by creating us after his own image so that we could share in his own thoughts. Kepler believed that the language of mathematics was crucial to "thinking God's thoughts" about the nature of creation, and he took seriously the role of astronomers as priests articulating God's book of nature.

This history explains why all branches of science were once called, not science, but "natural theology." Old-book lovers soon learn that pre-1900 books on chemistry, physics, or biology often contained the words *Natural Theology* in their titles. William Whewell (1794–1866) coined the word "science" in 1833 to describe a field of study that increasingly was seen as discrete from other forms of knowledge (Snyder, 2011, pp. 3, 148, 160).

Pastors once commonly preached from both the Bible and the book of nature (now called science). It is for this reason that many ministers once studied science, both in seminary and as an avocation (Snyder, 2011). The Scriptures illustrate this approach in passages such as Psalm 19:1, which proclaims that "the heavens declare the glory of God." A pastor thus typically studied nature to enable him to declare this truth to his congregation in a meaningful way.

William Paley, in his 1802 book appropriately titled *Natural Theology*, argued in over 400 pages that, after studying the wonders of creation, one would be forced to conclude that, like a watch, only an intelligent watchmaker can explain its origin. Even today, the number-one reason that people give for their believing in God is the existence of the wonders and beauty of the natural world, especially the living world (Shermer, 2000).

Thomas Aquinas, often regarded as the greatest Christian philosopher who ever lived, eloquently argued that wherever complex design exists, there must have been an intelligent designer behind it. The key to evidence for design is not complexity, per se, but *specified* complexity. A junkyard is very complex, as is also a modern jet airplane, but only the complexity in the airplane is *specified* for a specific purpose; viz., to rapidly carry cargo or passengers in the atmosphere from one place to another.

Preaching from the two books

Just as studying an artist's art works is an important way to learn about the artist as a person, so too studying the works of God

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Editor:
Glen W. Wolfrom

Assistant Editors:
Jean K. Lightner
Robert Hill

For membership / subscription information, advertising rates, and information for authors:

Glen W. Wolfrom, Editor
P.O. Box 8263
St. Joseph, MO 64508-8263

Email: CMeditor@creationresearch.org
Phone/fax: 816.279.2312

Creation Research Society Website:
www.creationresearch.org

(the book of nature, or science) is an important way to learn about the Creator as a person. A typical conclusion from this teaching is that of Anselm, an eleventh-century Christian who stressed that one learns about our Creator by studying his creations (Carroll and Shiflett, 2002, p. 71). As Proverbs 3:19 says, "The Lord by wisdom hath founded the earth; by understanding hath He established the heavens."

Likewise, we can better comprehend God by understanding the products of His wisdom. An advantage of studying the book of nature is that anyone, anywhere, can "read" it. As Howell noted (2002, p. 23): the "most striking feature in the language of nature was its clarity. Even the heathen can deduce from the heavens that there is a god." Critics of this view "tend to overintellectualize," ignoring how the marvels of design, existing everywhere in the natural world, from all of life, to chemistry and the laws of physics, support the biblical claims of the wonders of God's creation (Leegwater, 2009, p. 1).

Furthermore, the two-books view stresses that they are "in divine harmony," and each revelation supports and defends, and one often helps to both support and explain the other (Price, 1911, p. 9). Price (1911, p. 25) concluded from his research that "God's larger book of nature" confirms "his written word … showing the absolute harmony between the book of nature and God's written Word." The fact is, for many persons today God speaks "through the revelations of Scripture and Nature" (Hess, 2002, p. 45).

Out of this teaching grew the university system that we know today. The first colleges in Europe were called cathedral schools because college classes were often held in cathedrals. This is one reason why most early university buildings looked very much like cathedrals. Cathedral schools soon expanded into teaching not only theology, but also Latin and, later, science in order to train priests and others about God's creation.

Eventually, universities added law, medicine, and other subjects to their curricula. For this reason Carroll and Shiflett (2002, p. 71) concluded that the founding of the modern "university must be credited to the Christian church." All universities in the West and in the Americas were established and run by churches until fairly recently. Most colleges, even today, are, or were, church related. The first secular private university in the United States was Cornell, established in the late 1800s.

Conclusions

One of the most convincing proofs for the existence of a creator has been the existence of the creation. Eloquently propounded by Saint Thomas Aquinas and other prominent church fathers, this line of evidence was elaborated by William Paley and many others since then. Paley compared the intricacy and design of living organisms to mechanical watches. He concluded that it is immediately apparent when one holds a watch that it was designed by an intelligent engineer and built by skilled craftsmen. Likewise, the field of biology, which was just beginning to develop in Paley's time, has helped to convince many persons today of the validity of the logic that design indicates the existence of a designer.

This is one of several reasons why the two-books metaphor was taught in the churches and schools for centuries. To conclude, I will quote Roger Bacon who wrote in his tome, *Advancement of Learning,* that no man should "think or maintain, that a man can search too far or be too well studied in the book of God's word, or in the book of God's works … but rather let men endeavor an endless progress of proficiencies in both" (quoted in Darwin, 1859, reverse fly leaf). The fact is, God's world agrees with God's Word.

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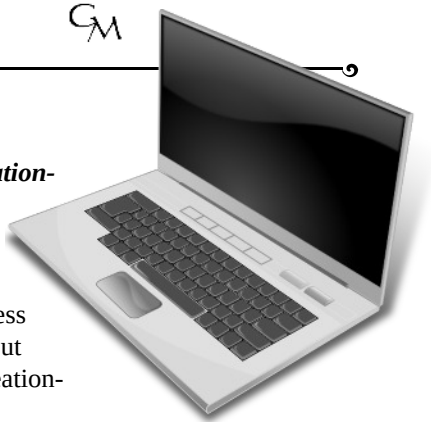

What Are Creationists Thinking about ...?

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.

If you prefer a web-based forum for discussion, CRSforum is also available to members.

For more information, send an e-mail message to Glen Wolfrom at contact@creationresearch.org.
Participation is limited to CRS members in good standing.

Geology's Virtual Past

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wizards of historical geology. Although he echoes Reed (1998; 2011), who noted that uniformitarianism is justified largely on necessary wishful thinking, he does so for different reasons:

> It can therefore be said that the geologists' knowledge of the past is based on pretheoretical assumptions, often of a metaphysical nature, not susceptible to logical or empirical proof. In a certain sense, *they are the products of the geologists' imagination*… (Kravitz, 2013, p. 21, emphasis added).

Kravitz (2013) believes this blindness to their belief system stems from a general ignorance of philosophy by earth scientists, but we think he misses the endemic lack of any self-correcting mechanism in their worldview. Naturalism is a belief system that cannot examine its axioms critically, because its adherents do not believe that it *is* a belief system. Labeling all other views "myths," they unwittingly create their own. A misplaced belief that science is truth prevents the necessary reflexive critique. Kravitz (2013) may share their naturalism, but sees these problems because he does not share their philosophical realism:

> However, this attitude indicates that geologists entertaining a realistic approach consciously or unconsciously assume that the time arrow is one-directional and irreversible (Kravitz, 2013, p. 20).

His analysis is devastating to historical geology for two reasons. First, it provides a *secular* critique that validates the creationist critique. Geologists have essentially created a virtual world, like that in the movie *The Matrix*, and live in that imaginary realm, not only oblivious to outside reality, but worse, oblivious to its very possibility. Kravitz (2013) bypasses issues more familiar to us, like time, evolution, and energy levels of past processes. Instead, he questions the foundations of the geological past, asking philosophical questions that geologists are ill-equipped to answer. He is rightly surprised at geologists' confidence in unexamined metaphysical assumptions. Creationists that emphasize the role of presuppositions and worldviews have noted similar problems (e.g., Klevberg, 1999; Reed, 2001).

Second, he proposes a weak solution

Problem	Christian Solution
realism - nature today	Doctrine of creation. God made world prior to man; reality not dependent on man.
realism - the past	Doctrine of providence. God maintains world and directs its history.
researcher independent from nature	Doctrine of creation. God made man in His image to rule over Earth. Assumes knowledge of it.
geologists "know" past	Doctrines of providence and revelation. Past is real and can be known.
one-way uniformity & causality	Doctrine of providence. God, who is outside time, made it to proceed from past to present
time is linear, and finite	God began history, moves it along a purposeful path towards a definite end.

FIGURE 2. Axioms of historical geology flow from Christianity. They are thus inexplicable by naturalism.

in contrast to the stronger theological answer of early scientists and today's creationists. Despite inroads by neocatastrophism, geologists are still essentially uniformitarian. Kravitz (2013), like others, prefers the term "actualism" to distance himself from errors associated with uniformitarianism (Austin, 1979; Gould, 1987; Hooykaas, 1963; Rudwick, 1971; Shea, 1982). He concludes (p. 32, bold in original) that "actualism" must be justified by uniformity and uniformity, by a continuity of cause and effect:

> **To sum up, we can say that actualism is based on the uniformity principle, which is essentially based on the principle of causality…**

This is what Reed (2011) and Reed and Williams (2012) concluded (Figure 1, upper part). If everything comes down to causality, then how is it justified, especially in the face of the massive causal discontinuity of the big bang? This is where Kravitz and Christians part ways. Kravitz would agree with the upper progression of Figure 1, but he justifies causal continuity differently than both historical geology and Christianity. He thinks that causality "**obtains its justification from the second law of thermodynamics**" (p. 32, bold in original).

What aspect of the second law does so? Kravitz (2013, p. 27) believes it is the time arrow of entropy that shows a constant linear trend over Earth's past:

> …why is it [second law] so important for geohistorical explanation…? In contrast to the other laws of physics, the second law of thermodynamics describes the macroscopic world of nature as a world governed by an asymmetric and irreversible time arrow—in other words, it describes a series of unique events, joined to each other and developing in one direction. Therefore, the majority of physical phenomena, irreversible in the time dimension, are explained by this law.

What better justifies the unobserved world of the past—entropy or God? A major problem for Kravitz (and other secularists) is that they place causality in the physical arena of matter, energy, and "natural law." Christians, on the other hand, attribute causal continuity to God's will. Thus, the big bang, which dramatically breaks the causal chain in the physical realm, is a serious problem for all secularists. They might try to argue that *ex nihilo* creation does the same thing, but in doing so, they miss the crucial distinction that Christians think causality is a topic of theology or metaphysics, not thermodynamics (or any other science). Christianity is consistent where secularism is not, able to account for physical discontinuities of Creation and miracles.

A further problem is that Kravitz (2013) does not realize that geologists' blind confidence in their virtual past is a historical leftover of the Christian worldview that dominated culture in geology's early days (Figure 2). As many have noted (e.g., Glover, 1984; Mangalwadi, 2012; Stark, 2003; 2005), Christianity gave birth to science. If so, we would expect vestiges of Christian theology in naturalism, which is precisely what we see (Reed, 2001 Reed et al., 2004). Kravitz' critique would be exponentially more embarrassing if he were to see this further argument for orthodox Christianity, and the inherent contradictions it creates for anti-Christian secular thinkers.

A third problem for Kravitz is the question of whether or not a *physical* law can justify a *metaphysical* axiom. A physical law may point to metaphysical reality, but justification is a different problem.

Fourth, his use of the "time arrow of entropy" to justify the "uniformity principle" is circular. The "time arrow" is a construct, extrapolated from observations of the past two centuries. There are no observations from a thousand years ago, a million years ago, or thirteen billion years ago. For that reason, almost the entire "arrow" is inferred, and that inference rests on the principle of uniformity. Thus, the argument is circular.

We agree with Hume that causality

cannot be empirically justified. We see the effects, but can never observe the cause. However, we can know the cause because we can know God via revelation. It cannot be proven by science, only by theological reasoning. Thus, Kravitz' case is much weaker than the Christian justification based on the nature and character of God.

Conclusion

Uniformitarianism is the bedrock of historical geology. For many years it was unquestioned—"the foundational principle of geology" (Challinor, 1968, p. 331). But cracks in the foundation appeared in 1961 with the release of *The Genesis Flood* and in 1963, with the critique of Reijer Hooykaas. Geologists suddenly realized that the word was equivocal. A 1963 Geological Society of America symposium, *The Fabric of Geology*, attempted to find a solution, but it was the 1965 article by Gould that turned to semantics for an answer, and that evasive strategy was widely accepted by geologists (Reed, 2010).

But Kravitz (2013) has forced the issue back to bedrock, and no appeal to semantics can rescue the virtual world of historical geology from itself. Contrary to Kravitz (2013), neither can an appeal to thermodynamics. Only a return to orthodox Christianity can provide a sound justification for causality, uniformity, and (in limited cases) for actualism (Reed, 2011).

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Letters

Dinosaur Size

The previous edition of *Creation Matters* contains an article by Dr. Donald DeYoung titled, "Why Were Dinosaurs so Large?" The basic conclusion of this article is probably accurate. Protection from predators, as well as digestive efficiency, might be primary benefits to the giant size of many herbivorous dinosaurs. (O'Gorman and Hone, 2012) However, this article also contains numerous, serious errors.

Eight out of the nine genera of dinosaurs in this table are misspelled by leaving off the "-us" at the end (e.g., *Tyrannosaurus* changed to *"Tyrannosaur"*). Why the author repeatedly removed these is unclear, but it was probably related to a misunderstanding of zoological nomenclature and terminology. Members of the family Tyrannosauridae (for instance, the genera *Tyrannosaurus*, *Albertosaurus*, and *Daspletosaurus*) are technically referred to as "tyrannosaurids," but they are often colloquially termed "tyrannosaurs." The lower-case term "tyrannosaur" could also refer to a member of the genus *Tyrannosaurus* (the scientific name must always be capitalized and italicized). However, it is never appropriate in any context to shorten specific names (e.g., refer to the genus *Compsognathus* as *"Compsognath"*).

Also wrong is the claim that, "the average adult size was that of a dog or sheep." The idea that many or most dinosaurs were smaller is a curiously enduring myth, perhaps popularized most by author Michael Crichton in *The Lost World*, his sequel to *Jurassic Park.* His character Ian Malcom

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Snowflakes in Heaven

a devotional by Kenneth G. Dale, DDS

This remarkable world in which we live is both simple and complex. It is simple in that it can be reduced to only four different interacting parts: Three building blocks of matter (protons, neutrons, and electrons) and one mobile force of massless energy (photons). The world is complex in that through the interaction of these four entities everything exists and functions. It's hard to believe that just these four entities compose everything we physically experience, but it's true (see "Clearly Invisible," *Creation Matters* Vol. 19, No. 2).

Every door of insight brings into awareness many more windows of the unexplored unknown.

We as humans must explain things in terms of what we know. We also like to explain things in terms of what we experience and can relate to. But as humans—created by God—we also intuitively (instinctually) know that there is so much beyond us; we have awareness that there is more to comprehend beyond our abilities to do so.

We can see this along the path of scientific investigation. Here, the investigation and exploration into answering questions about the world quickly produce more unanswered questions than answered ones. Any scientist will agree that the more one learns the less one knows, where every door of insight brings into awareness many more windows of the unexplored unknown. Although a scientist is attracted to the unanswered, and is driven to find those answers, and frequently finds them, he concedes that there are some questions unanswerable.

Our existence in this world is hard enough to figure out and explain, but what about the next existence in the new world to come?

"...all the old ways are gone… Look! I am making everything new!"
—Revelation 21:4–5 (NCV)

But in keeping with his promise we are looking forward to a new heaven and a new earth...
—2 Peter 3:13 (NIV)

God says we will have a new existence. When God says that all things will be made new, and when He says that there will be a new heaven and a new earth, what does he mean? We must be very careful here; there are some unfathomable possibilities to consider.

Consider this possibility: our current world of photons, protons, neutrons, and electrons may not compose the new heaven and the new earth. It's hard to imagine what that even means, but God could use something completely different and something greatly more complex to create our eternal existence. Perhaps the current building blocks of creation are mere shadows of something much more glorious to come. Can a frozen drop of water be expressed any more magnificently than through the ice crystals that compose a snowflake? Yes!

Go ahead and open your mind to the extremes of those possibilities, because God will only get bigger and bigger in your existence. Oh, and if you can think in those terms without exhausting your mind, continue on in the mental challenge and try to think in terms of a God that is timeless (See "Timeless," *Creation Matters* Vol. 19, No. 3).

But do not forget this one thing, dear friends: With the Lord a day is like a thousand years, and a thousand years are like a day.
—2 Peter 3:8 (NIV)

To you, a thousand years is like the passing of a day, or like a few hours in the night.
—Psalm 90:4 (NCV)

If time becomes little to no factor in the life to come, then the words that we use to distinguish different timespans will become meaningless. The phrase, "Wait a minute" becomes indistinguishable from: Wait a(n) _____ (instant, second, minute, hour, day, month, year, decade, century, millennium, eternity). Now we as humans, who are bound by time and experience time, can't really know what this would be like. Even when we are not aware of the presence of time (a short nap, a night's sleep, an extended coma) we are still fully subject to the effects of that time (the body still ages and the calendar continues). Of course we are still subject to time even though we may be unaware of it. Time is like gravity in that, on Earth, we are always subject to it. But God is not subject to gravity or time; neither has any effect on Him.

This is a difficult thought to entertain: To God, an instant of time may be the same as an eternity of time.

We must not restrict God with time and should allow for the possibility that to him an "instant" and "eternity" are not any different. The Bible hints at this when it says that two greatly different measures of time are in fact equivalent with no difference to God. Twenty-four hours may be equivalent to a day according to us, and a thousand years is like 365,000 days to us, but to God a day may not be any different from eternity. Yes, that thought is way out there, for sure, and not so comfortable (among other things), but it may be true.

While here in this realm of thought, here are some provoking questions: Will WE be subject to time in the new heavens and the new earth? If all things will be made new, does that include time? Will the new creation that is not subject to decay be built from the same building blocks that are currently subject to decay? Will there be snowflakes in Heaven? Will the snowflakes be made new and be something we have never seen or imagined before? Just look at all the windows in this room!

Such knowledge is too wonderful for me, too great for me to understand!
—Psalm 139:6 (NLT)

Perhaps like the cube is to the square, like the sphere is to the circle, or like the pyramid is to the triangle, so is the new creation to the old creation. The old creation could be a type or shadow of the new creation. Our current creation (and the four "building blocks" used) could be a mere shadow of what is to come. Most everyone believes that Heaven will be better and different, but we mostly mentally compose an image of what that may be from what we currently know. We envision old creation snowflakes, not something new. Why? Well, we are less likely to compose an image of that future existence from what is possible because we generally like to know what our future holds, and we prefer something better known over the unknown or unexplainable. This is God-restrictive thinking, however.

Can the created even fathom what is possible from the Creator? Not really...it's too wonderful for us. Can an amoeba (the

simplest form of life) comprehend the ways of man (the most complex form of life)? No, obviously not, on so many levels. Like the vast differences between the ways of amoebae and mankind are the vast differences between the ways of mankind and God. Be good with that.

Take refuge and comfort between the vast levels of difference between mankind and God. A state of wonder and awe is an appropriate state for the created in the presence of the Creator and His creation.

Everyone was amazed and gave praise to God. They were filled with awe and said, "We have seen remarkable things today."
—Luke 5:26 NIV

Yes, Heaven will last for eternity, but will it be subject to time? This is one of those unanswerable questions, beyond our abilities to comprehend. Yet we should not shy away from the possibility of its truth just because we cannot understand it or explain it. Just look at snowflakes and know they are simply beautiful, independent of understanding the complex physics and chemistry behind them. There are levels of complexity within a snowflake that even the best molecular physicist would concede as unknowable. This is not defeat, but rather a victory, when one also understands and concludes that there is a God who easily created every single one of these levels of intricate complexity. Yes, the unknown and unexplainable are actually a comforting thing and it points to a great and magnificent, all powerful God.

From whose womb comes the ice? Who gives birth to the frost from the heavens?
—Job 38:29 NIV

The next time you see a snowflake, know that the remarkable and glorious chemistry and physics behind its beauty reflects the One who created it. Oh, God, how wonderful it is to be in a state of awe in Your presence!

CM

Matters of Fact

by
Jean K. Lightner, DVM, MS

Carbon Copy DNA?

Editor's note: You may submit your question to Dr. Jean Lightner at 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 Don't all cells in a person's body contain exactly the same DNA sequence?

A It has been commonly assumed that this is true, at least in healthy cells. It has been believed that under normal circumstances DNA is copied exactly, each time before a cell divides. However, differences in DNA nucleotide sequence between different cells in the same person have been identified. This difference in sequence between different cells in the body is termed *somatic mosaicism*. While the difference can be one nucleotide found in the place of another, many of these differences are much larger. A number of structural changes have been identified where a large segment has been removed, duplicated, or moved to a new position (e.g., flipped). There are many cases where somatic mosaicism has been associated with cancer or some other disease (O'Huallachain et al., 2012).

However, not all instances of somatic mosaicism are related to disease. In fact, the ability to change the DNA sequence in cells is an essential part of the immune system that keeps us healthy. It does not involve a random sort of mutation that occurs in a haphazard way and is likely to destroy function. Rather the mutations are confined to a specific region and serve a specific purpose—to form an antibody in response to the antigen on a foreign invader (e.g., a bacterium or virus). Your life depends on this ability!

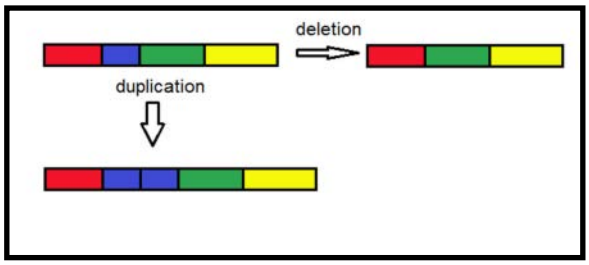

FIGURE 1. This figure depicts duplication and deletion of a segment of DNA ("blue," which may be thousands of base pairs long, or more). Both processes will change the number of copies present, and thus result in copy number variation (CNV). CNV is an important type of variation seen between humans and between cells within a single human.

It has been controversial whether somatic mosaicism is usually a sign of malfunction and potential disease, or if it is a normal characteristic of life. There are probably two reasons the first option has been strongly argued. First, some of the earliest examples known were associated with disease. This is not particularly surprising as disease research is relatively well funded. At one time bacteria were largely viewed in a negative way because they can be associated with disease. However, most bacteria are not associated with disease at all, and many are essential to life on earth.

A second reason why a person might argue that somatic mosaicism is a sign of potential disease is the underlying neo-Darwinian view that pervades our culture. For generations we have been told that all changes to the DNA sequence are the result of accidents or copying errors. If this were true, then it certainly would be expected that the majority of those changes would cause problems. Random changes in a complex system are certainly not desirable! However, this assumption is based on the idea that life was not designed and "natural processes" can explain its origin. Is there really a strong reason to stick with that assumption?

Recently, evidence has been accumulating that genetic differences between cells is a characteristic of apparently healthy tissues in adults. One type of variation is called copy number variation (CNV; see Figure 1). In one study involving six individuals, it was found that CNV occurs in

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many tissues including liver, kidney, pancreas, and brain. Some of the genomic regions involved are quite large. They often affect genes, especially those involved in regulation. There were a few examples where CNVs were found in the same region of the genome in different people, suggesting there may be hotspots (O'Huallachain et al., 2012).

Even more groundbreaking research has been done on the placenta in mice. Some earlier studies had suggested that CNV were not a common feature in the placenta of rodents, but a more recent study looked at a specific subset of polyploid trophoblast giant cells in mice. These giant cells are impressive because the large nucleus contains many extra sets of chromosomes, and because they carry out functions essential for the survival of the embryo. It has been concluded that somatic CNV are a normal part of placental cell biology (Hannibal et al., 2014).

More specifically, the researchers found 47 areas—totaling 6% of the genome—where segments of the genome were underrepresented due to underreplication (as opposed to deletion). They were in late replicating portions, having been marked with chromatin prior to endoreplication (replications of DNA without subsequent cell division). These regions are predominately gene deserts and genes involved in cell adhesion or neurogenesis. So while somatic mosaicism is as essential in the placenta as it is in the immune system, the mechanism of change is different from the deletion and recombination observed in the latter.

What does all this mean? It means that neo-Darwinian ideas about how the genome changes are wrong—it is not just random chance processes or copying errors. Instead, there are a number of designed mechanisms by which the genome can change to allow for life to reproduce and flourish, as God intended (Genesis 1:22, 28; 8:17; Isaiah 45:18).

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notes that, "Dinosaurs were mostly small.…People always think they were huge, but the average dinosaur was the size of a sheep, or a small pony." (Crichton, 1995) Ironically, creationists repeat this quote, even sourcing it to Crichton in writings, such as Ken Ham's chapter "What Really Happened to the Dinosaurs" in Answers in Genesis's *The New Answers Book*. (Ham, 2006) It is correct to say either, "Not *all* dinosaurs were large," or "*Some* dinosaurs were small," but it is not true that dinosaurs tended to be small.

While a thorough overview of dinosaur size (i.e., mass) is beyond the scope of this writing, several authors have touched on the subject. Comparing size estimates for 220 genera of dinosaurs, Peczkis found that early dinosaur discoveries may have been biased by a focus on finding large specimens, since the number of smaller dinosaur discoveries have increased over time. Nevertheless, he still found that "The 1–10 ton body-mass category is the modal one for all dinosaur genera…" and "…dinosaurs on nearly every continent…" (Peczkis, 1995) Recent studies confirm that, even factoring in the bias introduced by taphonomic processes, dinosaur body size was skewed toward larger sizes in a way unlike mammals. (O'Gorman and Hone, 2012) Estimations of dinosaur size have gone down for some genera over time, but the popular perception is still correct: dinosaurs tended to be quite large.

DeYoung provided examples of smaller dinosaurs, but even these are inaccurate. He refers to "*Compsognath*" (correctly *Compsognathus*), which he wrote, "…weighed about 15 pounds, the size of a large cat," as well as "*Psittacosaur*" (correctly *Psittacosaurus*), allegedly, "similar in size to a squirrel." The largest specimen of *Compsognathus*, MNHN CNJ 79, was likely an adult, and weighed perhaps around 2.5 kg (5.5 lb). (Paul, 1988) Domestic cats typically weigh around 4-5 kg (8.8-11 lb), so it was smaller, but close to the size of an average cat. Estimates for adult size in *Psittacosaurus* vary, depending on the species, between 5-18 kg (11-39.7 lb). (Paul, 2010)

With reference to the larger dinosaurs, DeYoung pointed to "*Argentinosaur*" (correctly *Argentinosaurus*) and "*Gigantosaur*," which he calls, "an economy-sized Tyrannosaur 42 feet long and weighing 8 tons." The latter is completely confused. It is not only misspelled, lacking the "-us" ending, but also, if corrected, it would refer to *Gigantosaurus* ("giant lizard"), an English sauropod, instead of the Argentine theropod *Giganotosaurus* ("giant southern lizard") the predator to which he clearly refers. *Giganotosaurus* was not a member of the family Tyrannosauridae, nor even remotely similar. It was a member of the family Carcharodontosauridae, a group containing *Acrocanthosaurus* and more similar to *Allosaurus* and kin. Nor, in comparison to tyrannosaurids, was it "economy sized" (most tyrannosaurids were smaller).

In the table of sizes, the "*Ultrasaur*" (correctly *Ultrasauros*) is no longer a valid genus, since it was mistakenly composed of a combination of *Supersaurus* and *Brachiosaurus* bones.

Inaccurate data about average dinosaur size and the size of specific species, as well as inaccuracies relating to classification, growth patterns, and the misspelling of the majority of dinosaur names detract badly from this article. Historically, the unfortunate trend is that the majority of material published by creationists about dinosaurs has been characterized by significant scientific errors. If creationists want to provide a compelling counter argument to the way dinosaurs are usually presented as evidence for evolution, greater rigor and scientific accuracy are necessary. The suggestion is made that the CRS consider the addition of a Paleontology Editor, both to improve quality and prevent material with significant errors from being published in the future.

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— name withheld by request

Author's Reply

I thank the letter writer for his response to the *Creation Matters* article concerning dinosaur size (DeYoung, 2014). His main criticism concerns dinosaur names such as stegosaur versus Stegosaurus. He demands use of the latter systematic genus name. However, in popular literature many writers prefer the suffix "saur" instead of "saurus." This shorter term is a nonspecific common name, as intended in the *Creation Matters* article. Most readers are aware of the generic distinction, that *Stegosaurus* is a stegosaur, but not all stegosaurs are the specific *Stegosaurus* (Hone, 2012).

Further questions concern the average size of dinosaurs, their life spans and rates of growth. Each of these topics remains uncertain and under discussion. I agree with the writer that current estimates trend toward a larger average size for adult dinosaurs.

The letter's author also implies that non-paleontologists lack credibility in writing about dinosaurs or paleontology in general. From this I conclude that he may have missed the entire point of the article: The physical size of all living things, including dinosaurs, is limited by the mathematical relationship between their volumes and cross-sectional support areas, a physics concept which non-physicists, even paleontologists, should appreciate.

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Speaking of Science

Editor's note: Unless otherwise noted, S.O.S. (Speaking of Science) items in this issue are kindly provided by David Coppedge, editor of "Creation-Evolution Headlines" at http://crev.info. Opinions expressed herein are his. Unless otherwise noted, emphasis is added in all quotes.

Beware of Misinterpreting Water Claims

A claim of vast reservoirs of water deep in the earth is based on indirect evidence, and likely has little or nothing to do with surface water or floods.

ScienceDaily reported, "**New evidence for 'oceans' of water deep in Earth**: Water bound in mantle rock alters view of Earth's composition."[1] The amount of water may be triple the volume of all the earth's oceans and lakes combined, the article says.

> Researchers from Northwestern University and the University of New Mexico report evidence for **potentially oceans worth of water** deep beneath the United States. **Though not in the familiar liquid form** — the **ingredients** for water are **bound up in rock** deep in the Earth's mantle — the discovery may represent the planet's **largest water reservoir**.

The water is inferred to exist indirectly through echoes of seismic waves. Scientists believe it became entrapped in mantle rock during subduction of continental plates.[2]

A key point about this water is that it is bound up in mantle rock; it does not exist in a liquid form. Indeed, it cannot be liquid, because it is under extreme pressure and heat in the transition zone between the upper and lower mantle. Being 250 to 410 miles deep, it has no way to reach the surface and influence the oceans except through plate tectonics. The "ingredients" for water are bound up in minerals like ringwoodite and wadsleyite that can contain 1–3% water by weight.

1. Northwestern University. (2014, June 12) New evidence for 'oceans' of water deep in Earth: Water bound in mantle rock alters view of Earth's composition. ScienceDaily. Retrieved June 20, 2014 from www.sciencedaily.com/releases/2014/06/140612142309.htm
2. Schmandt, B., S.D. Jacobsen, T.W. Becker, Z. Liu, and K. G. Dueker. 2014. Earth's interior. Dehydration melting at top of the lower mantle. *Science* 344(6189):1265–1268.

Your Inner Ape Just Got Older

Evolutionists have doubled their date of the chimp-human split from 7 million to 13 million years ago. How, and why?

National Geographic announces gleefully, with a picture of a chimp playing with a child, "**Ancient Human-Chimp Link Pushed Back Millions of Years.**"[1] Based on a study of chimp genes in *Science*,[2] the claim adds another problem, just in time for Father's Day: the researchers claim that males contribute 90% of random mutations to the next generation (Gee thanks, Dad).

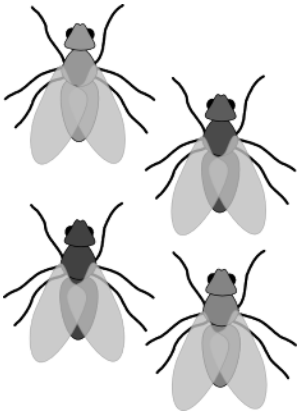
One might think that doubling the age of the split would cause problems for evolutionary dating, but evolutionists are clever. They found a way to make both dates true:

> **On the surface**, this and other recent studies **contradict the general consensus** suggested by the fossil record: that the last common ancestor of the two species, a flat-footed ape, lived some seven million years ago.
>
> **But both observations could still be true**, said paleoanthropologist John Hawks of the University of Wisconsin, Madison, who was not involved in the new study. **The ape-like common ancestor species might have endured until 7 to 10 million years ago, long after the genetic split** between chimps and humans, he said.

The new estimate is based on current mutation rates in the sample, but a lead author confessed, "**We also don't know** if mutation rates **varied widely in the ancient past**; **maybe** they were different than now." So this is a tentative reassessment, based on chimpanzee genes from only two males, two females, and their offspring covering 3 generations (9 individuals total). There's plenty of wiggle room left, therefore, if they look at a bigger sample, or the genes of other primates. Chimpanzees are notoriously promiscuous. The older the male, the more mutations, too. Varying mutation rates "could also **change estimates** of the **age of an ancestral genetic split** between men and chimps."

1. Vergano, D. (2014, June 12) Ancient human-chimp link pushed back millions of years: Older male chimps sped evolution and reset era of our last common ancestor with apes. *National Geographic Daily News.* Retrieved June 20, 2014 from http://news.nationalgeographic.com/news/2014/06/140612-chimp-father-evolution-human-science/
2. Venn, O., I. Turner, I. Mathieson, N. de Groot, R. Bontrop, and G. McVean. 2014. Nonhuman genetics. Strong male bias drives germline mutation in chimpanzees. *Science* 344(6189):1272–1275.

Without Bromine, There Would Be No Animals



A 28th element has proven to be essential for life: bromine. Vanderbilt University scientists[1] have added another element to the list of elements vital for life.

> In a paper published Thursday, June 5, in the journal *Cell*, Vanderbilt University researchers **establish for the first time that bromine, among the 92 naturally occurring chemical elements in the universe, is the 28th element essential for tissue development in all animals**, from primitive sea creatures to **humans**.
>
> "**Without bromine, there are no animals.** That's the discovery," said Billy Hudson, Ph.D., the paper's senior author and Elliott V. Newman, Professor of Medicine.

Why was this not found earlier? Unlike calcium, iron, potassium and other elements, bromine does not make up any organelles or "machines" in the cell. It works indirectly during the construction of tissues. But without its participation, there would be no animal life, the investigators found. A 4-minute embedded video explains the importance of this discovery. The team was obviously

Math Matters

by

Don DeYoung, PhD

Did Dinosaurs Have Small Brains?

In years past dinosaurs were commonly pictured as primitive, dim-witted giants. Their reputations included large muscles and fearsome teeth, but small brains. This view changes when one realizes the true complexity of dinosaurs. Most large reptiles have relatively small brains, but this actually says little about their behavior or thinking ability.

A creature's brain is a bit like a wallet — the contents are much more important than the size. Even a small brain is capable of complex processing, with a limited correlation between intelligence and brain size. At the same time, of course, a large brain provides more room for neurons and interconnections, both of which are thought to increase intelligence.

The weight of many animals' brains is found to follow a power law based on an animal's total body weight (Koch, 2012). For birds and mammals, brain weight closely follows the relation

$$\text{brain weight} = 0.07\ (\text{body weight})^{2/3}$$

For fish and reptiles the relation is found to be different, giving a brain ten times smaller,

$$\text{brain weight} = 0.007\ (\text{body weight})^{2/3}$$

Some animals' brains are found to exceed the calculated weight, while others have a smaller than expected value. One comparative measure of brain size is called the encephalization quotient (EQ), defined by paleontologist H.J. Jerison in the 1960s. The EQ compares an animal's actual brain size with the prediction from the previous equations,

EQ=actual brain size/calculated brain size

The EQ values for people and also for several animals are shown in Table 1 (DeYoung, 2000). EQ values less than one (<1) imply that the creature's brain is smaller than expected. Values greater than one (>1) imply that the brain is larger than expected for this size creature. Note from the table that a relatively large brain size occurs in some dinosaur species. The conclusion is that not all dinosaurs had undersized brains. This is especially true for the Troodontidae, a family of bird-like theropod dinosaurs. Dinosaur brain size is based on fossil skull measurements. Their brains were no smaller, relative to animal size, than modern lizard and crocodile brains.

Table 1

The encephalization quotient (EQ) for people and several animals

Creature	EQ
Diplodocus, Brachiosaurus	0.1
Stegosaurus, Triceratops, Ankylosaurus	0.2
Protoceratops, Iguanodon	0.6
Tyrannosaurus	0.9
Elephant	1.2
Man	1.5
Troodontidae	>5

The table shows that stegosaurs had small brains, only walnut-sized in some cases, and weighing 2–3 ounces. This does not mean they were "dumb" animals in any sense. However, it suggests that they probably relied on defensive armor rather than swift motion when they encountered predators. Incidentally, the largest known animal brain, reaching 20 pounds, belongs to the sperm whale. In comparison the human brain weighs about 3.5 pounds.

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delighted to find one of the "**incredibly fundamental things**" about life, a finding that could have important real-world applications in disease treatment.

Foundations for the discovery were laid in the 1980s, when researchers found that certain patients had defective collagen-IV, an essential protein for tissue development. Since then, several patient groups have been found to be bromine-deficient. The Vanderbilt team found that fruit flies deprived of bromine in their diet had radically deformed tissues, and most died. The flies could be rescued, however, by addition of bromine to the diet. Subsequent research found that bromide (the ionic form) is an important cofactor for the enzyme peroxidasin, which builds collagen-IV. Bromide plays a key role in formation of the sulfilimine bond. "**The chemical element bromine is thus 'essential for animal development and tissue architecture,'** they report."

1. Snyder, B. (2014, June 5) VU investigators confirm bromine's critical role in tissue development. *Research News@Vanderbilt.* Retrieved June 20, 2014, from http://news.vanderbilt.edu/2014/06/investigators-confirm-bromine-critical-role-in-tissue-development/

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All by Design

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

Monarch Magic

These colorful butterflies possess several characteristics that defy attempts to explain their coming into existence by random mutations.

First, female monarch butterflies lay their eggs on milkweed plants, which the newly hatched caterpillars eat until they are ready to begin their metamorphosis into adult butterflies. The thing is, milkweed plants are poisonous to predators such as birds. The caterpillars ingest toxins from the milkweed plant and retain those toxins in their bodies as butterflies, which in turn strongly discourage birds and other predators from eating them. It is a lesson the predators do not forget!

Photo credit: G. Wolfrom, 2013.

Secondly, several generations of monarchs are born each year, and each usually lives only a few weeks. However, the final generation of each year can live for many months, and it is these butterflies that make a remarkable winter migration to warmer areas in Mexico, California, and even South America, up to 6,000 miles round-trip. The following year, without map or compass, the butterflies return to their home territories all over North America to reproduce.

How did these butterflies know that their offspring can safely eat a plant that would make most other animals sick, sometimes fatally? How do such fragile creatures possess the stamina to fly thousands of miles? And how did these butterflies acquire the understanding necessary to navigate such distances? How could all of these characteristics occur by chance? Though possessing no voice, these beautiful creatures testify loudly to a planned creation of perfect order.

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