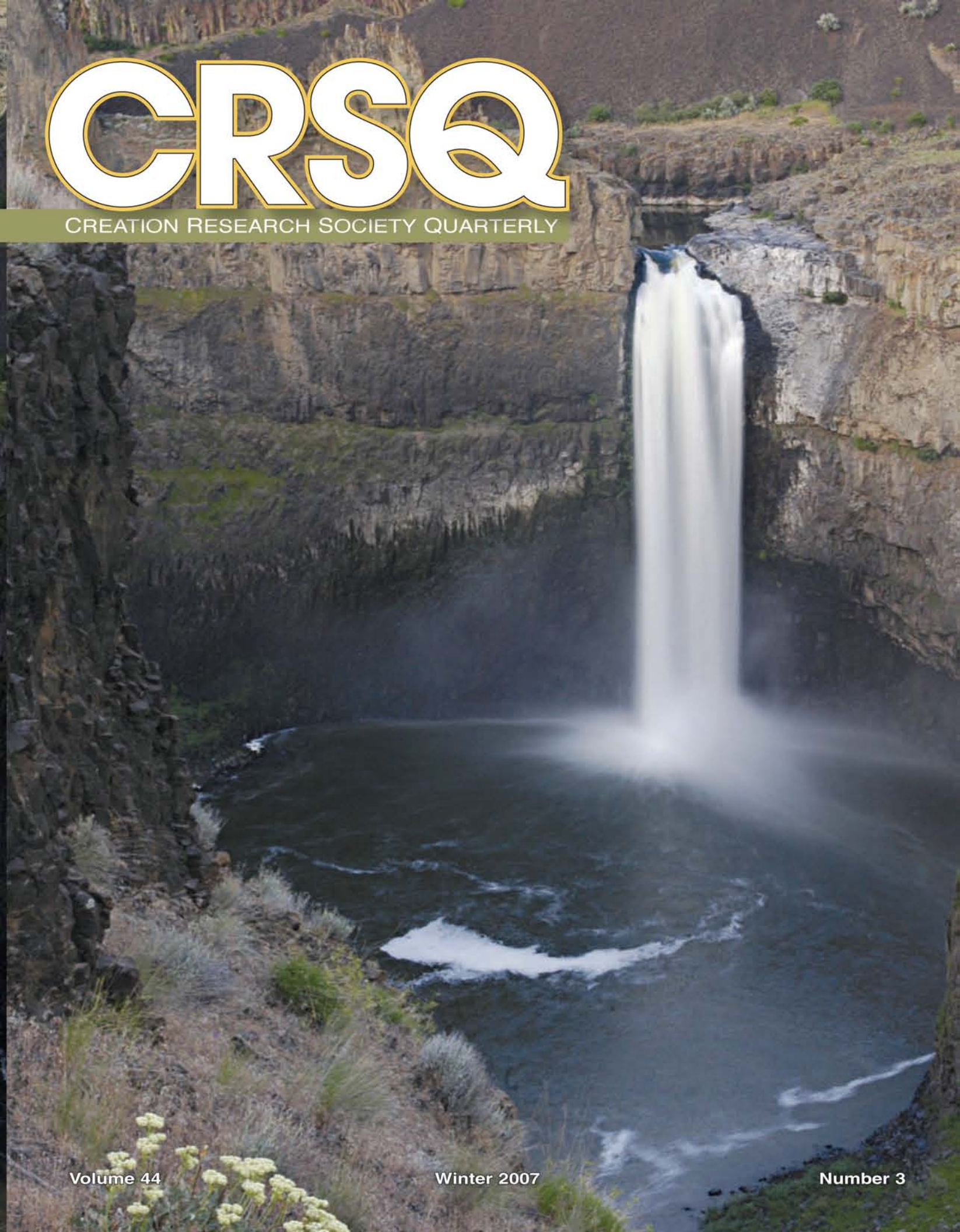




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Haec Credimus

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

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The Geologic Column: Perspectives within Diluvial Geology

John K. Reed and Michael J. Oard, Editors 2006. Creation Research Society, 157 pages. Regular price: \$15.00; Member price: \$11.00.

Many wonder how the evolutionary/uniformitarian geologic column fits into diluvial geology. At present, there is a remarkable diversity of original thought on this subject. Recent exchanges in the creationist literature show a tendency for various participants to talk past one another. This book has brought these different perspectives together with two goals: 1) to better define the real differences within diluvial geology, and 2) to identify the concrete issues that will provide a basis for continued research and, hopefully, future resolution. The editors went one step further by providing, at

the end of most chapters, a forum with comments and responses. In addition to the editors, the other authors are: Terry Mortenson, Peter Klevberg, Carl Froede Jr., David J. Tyler, Harold G. Coffin, and Emil Silvestru. Though it may be difficult to visualize now, diluvial geology represents a major paradigm shift that holds the potential to stimulate a revolution within the earth sciences.

Creation vs. Evolution Debate

2006. Creation Research Society, approx. 45 minutes. Audio CD. Regular price: \$10.00; Member price: \$8.00.

Dr. Kevin Anderson (director of the Society's Van Andel Creation Research Center) squares off against local Arizona anti-creationist, Nigel Reynolds. The debate features initial arguments by both presenters followed by lively rebuttals, cross-examinations, and audience questions. This debate provides the listener an excellent opportunity to weigh the arguments of each side and seriously consider where the scientific evidence best fits.



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Editorial

Common Knowledge

It has been said that “common knowledge” is not always so common, and often not very knowledgeable. Not too distant in human history, numerous ideas and “facts” were generally considered “common knowledge.” Yet many of these are almost laughable to us today.

For example, it was “common knowledge” that if man were meant to fly he would have wings. It was “common knowledge” that dirty rags and rotting meat could spontaneously generate into living creatures, such as maggots and mice. It was “common knowledge” that disease was caused by “bad” air or too much blood. It was “common knowledge” that ulcers were caused by excessive stress. It was “common knowledge” that humans would not perform well in the weightless conditions of outer space.

Man’s journey to fly is well documented and can be verified by simply looking into the sky of virtually any industrialized country. The “common knowledge” that humans were never meant to fly was patently wrong. The same can be said about the “common knowledge” of spontaneous generation. While data contradicting the claims of spontaneous generation had been gradually accumulating for centuries, ardent supporters steadfastly defended their position. Opponents were strongly criticized for their ignorance.

Slowly, other erroneous ideas that were generally accepted as common knowledge were gradually dismissed and relegated to the history of “bad ideas.” By

the nineteenth century, the most popular explanations for the cause of common diseases were poisonous air (miasma theory) or spontaneous imbalances in bodily tissues (aka, humors), such as the blood (humoral theory). This later theory led to the practice of phlebotomy (“blood letting”), a misguided attempt to remove the “excess” blood so that a proper balance of the humors could be restored. The most famous victim of this procedure was George Washington. The early suggestions by Louis Pasteur and others that microscopic organisms were involved in causing disease were frequently met with dismissal and ridicule. After all, it contradicted “common knowledge.”

We now recognize that microscopic organisms, such as bacteria and viruses, are intimately involved in causing many diseases. For example, injection of a specific protein from the bacterium *Clostridium botulinum* into an otherwise healthy individual will quickly result in a potentially deadly illness called botulism. Vaccines targeting specific microbial pathogens have all but eliminated what were once global terrors, such as small pox and polio. Certainly some human diseases may involve more than just the actions of microorganisms, but the direct microbial link to many diseases is firmly established.

Ulcers were long assumed to be caused by reduced blood flow to the stomach, a condition associated with stress and nervous tension. This reduction in blood flow presumably decreased

the excretion of protective mucus around the stomach lining, increasing the stomach cells’ exposure to gastric acids. This was considered the breeding ground for gastric ulcers. Treatment for these ulcers generally included antacids, stress reduction counseling, and other approaches aimed at keeping blood flow steady and stomach acids in check. The association of gastric ulcers with stress was hard to deny and appeared to be based on strong medical evidence. Even the treatment success seemed to support the thinking.

In the early 1980s a young Australian physician, Barry Marshall, began to question this “common knowledge” and suggested that the key player in ulcer de-

Common knowledge

is not always

so common,

and often not

very knowledgeable.

velopment was not stress or gastric acids but a bacterium, *Helicobacter pylori*, to be exact. His idea was widely considered preposterous by the medical community. It simply made too much sense to blame ulcers on stress and gastric blood flow. Despite extreme criticism and skepticism, Marshall persisted. Eventually he provided experimental evidence linking ingestion of the bacterium to almost immediate onset of gastritis and often gastric ulcers as well. Part of this experimental evidence was the somewhat dramatic step of self-ingestion of the bacterium. His subsequent rapid and severe gastric illness helped support his position. Today the role of *H. pylori* is difficult to dispute, and extremely successful treatment for gastric ulcers is based on treating *H. pylori* infections.

When NASA was first contemplating the engineering requirements for human space travel, many people thought that humans could not perform well under zero gravity. The first episode of the TV show *Twilight Zone* (airing October, 1959) helped popularize this perception. Even a number of medical professionals (including then President Kennedy's head science advisor) were convinced that humans would have severe difficulties in space (Kraft, 2002). They proposed the need for nearly a hundred animal tests, including many that would likely have sacrificed the animal. This approach would have delayed American human space travel by years. There would have been no moon landing in July of 1969.

The assumption of severe human vulnerability in space was not based upon any scientific information, but simply the assumption that the human body could not adapt well to such a unique and different environment as the weightlessness of space. (Seems I hear the lingering chant of, "If man were meant to fly . . .") The space flight of Soviet cosmonaut Yuri Gagarin on April 12, 1961 silenced all criticism, and American space travel rapidly

followed. But many in NASA felt this unwarranted assumption prevented an American from being the first man in space (Kraft, 2002).

What about today? After all, we are the educated, the enlightened, the informed. Surely we finally have all our facts straight.

Everybody knows that everyone thought the earth was flat until Christopher Columbus proved otherwise. This view has even been promoted by some twentieth-century historians. I very clearly recall being taught this version of history as an elementary school student. However, as early as the third century BC, Aristotle provided simple observational evidence for the spherical nature of the earth. In 240 BC Eratosthenes estimated the earth's circumference (an estimate that was within 20% of the actual circumference). In the first century AD, Pliny the Elder claimed that virtually everyone accepted that the earth was round or cone shaped, although there was still uncertainty about how the oceans could be maintained in a curved shape (the effects of gravity were not yet recognized). Ptolemy made additional arguments for the spherical shape of Earth in the second century AD and developed the system of latitude and longitude. His writings strongly influenced studies in geography and astronomy throughout the next several centuries.

There is little historical evidence that ideas of a flat earth were very prominent at the time of Christopher Columbus. The contemporary erroneous revision of history apparently can be directly traced to Washington Irving's highly fictionalized account of Columbus, *The Life and Voyages of Christopher Columbus*, published in 1828. Other fictional and less-than-scholarly work from the nineteenth and even the twentieth century contributed to the myth. In fact, this distorted view of history seems to have been an intentional attempt to impugn Middle Age Europe and particularly the Middle Age church (Russell, 1991).

In point of fact, the only significant disagreement among scholars in the Middle Ages (including church leaders) seems to have been whether it was possible for humans to be living on the "underside" of the earth. Columbus's opponents were not critical of his view of the earth's shape, but of his view of the earth's size. They contended that Columbus envisioned too small of an earth and concluded that he had little chance of actually reaching the very distant East Indies by sailing west. Ironically, Columbus's critics were correct, and only his accidental discovery of "the new world" prevented his exploits from becoming merely a minor footnote in history.

Everybody knows that Galileo was persecuted by the "church" because he made scientific claims that contradicted the teachings of the Bible. This tale continues to be repeated, usually for the purpose of showing how Christian ignorance interferes with the noble efforts of human investigation and learning. Specifically, this version of history is often used against creationists in an attempt to marginalize us. Supposedly, we creationists represent the same ignorant religious zealotry of the seventeenth-century church persecuting the hapless Galileo regardless of the scientific data.

However, the actual events surrounding Galileo and the "church" are quite different from this popular anecdote. For nearly 30 years Galileo maintained a type of "running battle" with his fellow astronomers and mathematicians at the University of Pisa, Italy. It also should be recalled that Galileo was a rather outspoken and caustic individual, which did nothing to help him persuade his opposition. In part, this intense disagreement was over the structure of the solar system and whether the sun orbited the earth or the earth orbited the sun. Such discourse and disagreement is actually part of the purpose of the university system envisioned by Plato, a universal

gathering of ideas. (It is interesting how far the contemporary university system has moved away from this philosophy.) Only after decades of trying to silence him did Galileo's critics seek to make this a theological conflict.

In requesting (even insisting) that the Catholic Church take their side on this topic, Galileo's critics invoked what has since become a very familiar strategy—make biblical understanding subject to contemporary “scientific” understanding. In other words, they told the Catholic authorities in Italy that since we “know” this to be the design of the universe, this is what the Bible must teach also. Thus, contrary to the popular and oft-repeated legend, what Galileo faced was not the “church” barging into academia and telling scientists how and what to think. Rather, it was “scientists” insisting that biblical understanding be subject to their particular vision of the cosmos. This is the very opposite of the popularized story and actually an early example of what we see today: Genesis must conform to evolutionary conclusions because we *know* evolution is correct. Thus, scientists must bow to evolution as well, or risk loss of job, career, or even worse. Who is the real religious zealot?

Certainly *everybody knows* that the earth is gradually warming because of human industrialization. Elaborate models and calculations have been offered to support this contention. Most public school children in the United

States and Europe are being taught global warming as a matter of common “fact.”

However, in the face of this common “fact” are some points that all creationists need to consider. None of the current global warming “models” accept an earth history that includes a global flood or an earth of only a few thousand years of age. Either of these situations dramatically alters our understanding of the earth's climate history and thus dramatically changes any predicted climate changes as well. Instead, global warming evidence is based almost exclusively on an evolutionary interpretation of earth's history.

What is more, while global warming is considered a worldwide event, many reporting stations have actually found a decrease in temperature during the twentieth century. For example, New York City has indeed shown an increase in surface temperature, but less than 250 miles away, cities such as Syracuse, West Point, and Albany have actually shown a decrease in average surface temperature since 1930 (see data provided by http://data.giss.nasa.gov/gistemp/station_data; accessed October 2, 2007). Such geographical inconsistencies challenge the “global” in global warming and suggest there are many factors affecting global climate beyond simply the level of CO₂ from human industrialization. In fact, the recording station at Punta Arenas, the closest city to Antarctica, has re-

corded an average decline of over 0.5°C in surface temperature since 1888.

But the power of a paradigm can acquire a life of its own. Political candidates (and even scientists) who express some skepticism about global warming have an increasingly steep mountain to climb against an ever-louder voice of proponents. Suddenly everything is explained by and blamed on global warming. Global warming has been blamed for both an increase and a decrease of hurricanes. It has even been blamed for increased teenage drinking, terrorism, increased crime, and a slowing of the earth's rotation. Am I joking? See <http://www.numberwatch.co.uk/warmlist.htm>. Perhaps the only thing not on this list is a hangnail, although it may be soon.

And, finally, *everybody knows* that life on this planet is the wondrous product of evolutionary descent from a common ancestry. All intelligent and educated people agree. It is “common knowledge.” It is the power of the paradigm.

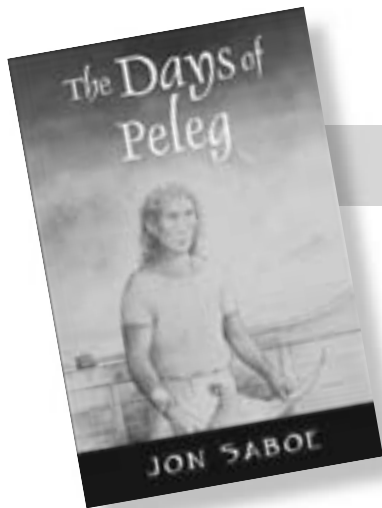
Kraft, C. 2002. *Flight: My Life in Mission Control*. Plume, New York, NY.

Russell, J. 1991. *Inventing the Flat Earth: Columbus and Modern Historians*. Praeger, New York, NY.

Kevin Anderson, Ph.D.

Editor

Creation Research Society Quarterly



Book Review

The Days of Peleg

by Jon Saboe

Outskirts Press, Denver, 2007, 619 pp., \$20.00.

Genesis 10 lists the genealogy of Noah's three sons, Japheth, Ham and Shem. Verse 25 gives special emphasis to one of Shem's descendants, Peleg, "for in his days the earth was divided" (NASB). At least two schools of thought exist among conservative Bible scholars about this phrase. One view is that the earth divided along political, social, and linguistic lines. The other believes this is a primitive reference to the continents moving apart via continental drift or plate tectonics.

Jon Saboe has collected a great amount of data about the early post-Flood years. This novel is his effort to develop a plausible scenario making sense of the information. Saboe's research comes from ancient history, anthropology, archaeology, astronomy, biblical theology, biology, cartography, demonology, genetics, geography, geology, information theory, linguistic studies, mythology, pagan religions, physics, technology, and other fields.

The book divides into four sections of historical fiction. The first section introduces Peleg and the world he lived in about two centuries after the Flood (euphemistically called the Great Calamity). Peleg was a citizen of Ur of the Chaldees. The prevailing philosophy in Ur is one closely akin to the modern materialist/secular worldview. Empirical

knowledge is venerated, and anything supernatural is shunned as rank superstition to be avoided and censored. This antihistorical secularism is strongly promulgated by the city-state's "enlightened" leaders. Peleg, indoctrinated in this mind-set, accepts it with few reservations.

The second section recounts a 12-year voyage of discovery. Several large sailing vessels are outfitted for a global circumnavigation odyssey with the primary purposes of charting the geography of post-Flood earth and making contact with human tribes that have spread out from the Middle East. Peleg is the chief cartographer on one of these ships, the *Urbat*. During this voyage the *Urbat* visits Easter Island, southern Peru (Lake Titicaca), Antarctica, the Rock of Gibraltar, and other places with many harrowing adventures. The writer presents imaginative solutions to the giant statues on Easter Island and the Nazca Lines in southern Peru.

The third section begins after the voyage abruptly ends with the violent sinking of the *Urbat* by hostile Gutians. Peleg is taken prisoner by these supposed barbaric cave dwellers and meets an eccentric but brilliant older man who reminds one of the Ben Gunn character from Robert Louis Stevenson's classic *Treasure Island*. This man, whom Peleg

thinks is quite mad, nevertheless fascinates Peleg and challenges the younger man to reconsider what he has been taught since childhood. The older man turns out to be Shem, Peleg's ancestor and a survivor of the Great Calamity.

The fourth section deals with Shem and Peleg's return to Ur. During the almost 14 years of Peleg's absence Ur has gone from a secular humanist to a cosmic humanist (New Age) mind-set. This worldview shift was fomented by the political manipulations of the scheming and occultic Inanna, daughter of Sargon (the biblical Nimrod). Inanna and her son Tammuz provide the origin for the Queen of Heaven cult mentioned in Old Testament Scripture, as well as the mythical goddesses Ishtar and Astarte. In this last section Peleg is forcefully separated from Shem, and the focus turns on Shem's later life and his influence on Abram through his student Melchizedek.

This book is a novel, a work of historical fiction. In fiction, I look for three main criteria: theme, plot, and characters. The prevailing theme is the search for the ancestors of the coming Zeh-ra (Messiah). Author Saboe develops this theme throughout the book, so well that it approaches being a theological anachronism. Shem has very advanced insights into the future coming and purpose of

Zeh-re and gives a prayer for accepting the Creator (Yahweh) and the Zeh-re as Savior (p. 514). I would like to think that such theological knowledge was extant in 2200 BC, but it seems to somewhat overshadow the progressive nature of biblical revelation. In any event, I'll defer to more astute theological minds on this issue.

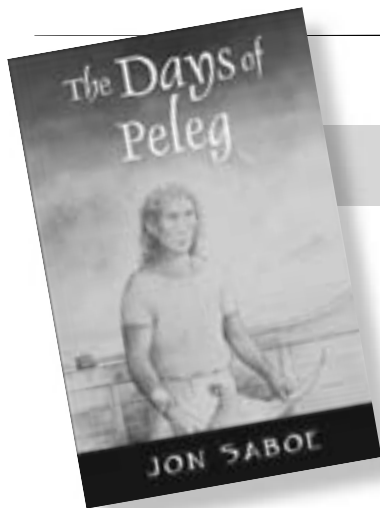
The plot moves along well with adventure and frequent, lengthy, though interesting, didactic discussions. The novel's weakest component is the characters. As a reader I never began to care for Peleg. His main purpose, especially in the latter part of the book, seems to be a humanist foil for Shem's theological discourses. I appreciate that toward

the end Peleg finally accepts the reality of the Creator and the coming Zeh-re. However when Peleg is captured while trying to escape Ur, and written out of the book, I didn't miss him. Shem was a much more interesting and fully realized person. He was a man with a long history, full of faith and doubt, with an energetic liveliness lacking in the title character.

Who is the audience for this book? Historical novels often contain romantic relationships that attract a large female audience. This book lacks a compelling human love story and the only strong woman character is the sinister and evil Innana. Initially I thought the book was aimed at young people. However some

very graphically described fight scenes might give some parents pause. Saboe, who writes in a lucid manner, does a great job of evoking a dark, depressive, pagan atmosphere reminiscent of C.S. Lewis's *Till We Have Faces*. The prime readership for this book is people of any age or gender who are curious about the early post-Flood world. Saboe successfully creates a plausible world, given his research, unencumbered by a secularist/evolutionary worldview. This book is recommended for those desiring an imaginative trek through pre-Abrahamic Bible history.

Donald Ensign
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Book Review

The Days of Peleg

by Jon Saboe

Outskirts Press, Denver, 2007, 619 pp., \$20.00.

The Days of Peleg by Jon Saboe is a historical novel taken from a few pieces of data and Scripture that are woven into an exciting story. It takes place shortly after the judgment of the Tower of Babel and continues until Peleg's death. Saboe has gathered well-known and lesser-known archeological finds from around the world that indicate that early peoples were vastly more intelligent than main-

stream scientists assume. He exposes this assumption as coming from belief in evolution. The author does an excellent job of portraying what the early world was like. *The Days of Peleg* is a masterful story that gives credible possibilities as to why and how the Tower of Babel rebellion could have occurred and what form the subsequent judgment could have taken. Saboe describes how knowledge

of the Creator could have been lost and how false gods arose. The book is filled with adventure, as it explores the consequences of lust for power and adulation, the pride of intellect, and the search for truth. *The Days of Peleg* can be ordered through Amazon.com.

Beverly Oard

Toppling the Timescale Part I: Evaluating the Terrain

John K. Reed*

Abstract

The geologic timescale has stood as a fortress of uniformitarian natural history for nearly two centuries. It is an intellectual idol that must be overthrown in order to reassert biblical authority in the realm of natural history. Most creationist critiques focus on empirical detail and thus fail to address the weak religious and philosophical foundations of the timescale. These foundations, rooted in the worldview of naturalism, are the key to overthrowing the flawed and misleading timescale.

Introduction

Lyell's *Principles of Geology* was published nearly thirty years before Darwin's *Origin of Species*, and its Victorian vision of a well-regulated uniformitarianism opened wide the door to the long ages Darwin would need for his "struggle for survival." Perhaps it is not surprising then that evolution has proven less resistant than its geological precursor to a robust Christian response. Many who reject evolution find a multibillion-year history quite reasonable. Perhaps such inconsistency reflects the successful debunking of the icons of evolution, while the crowning achievement of uniformitarianism—the geologic timescale—remains intact, with most criticisms focused on the amount of time rather than the construct that generates it.

Why is the timescale so compelling? After all, the modern creationist movement traces its roots to *The Genesis Flood*, a book that strongly opposed it. I

believe that our failure to discredit the timescale arises from an inability to see beneath its attractive framework to its foundations that were firmly established to overthrow biblical history. To correct this error, we must see uniformitarian history as a cornerstone of the naturalist worldview (Reed, 2001). Then we must discredit its icon—the timescale. Not simply the *time*, but the *timescale*.

This series will examine the foundational methods and assumptions behind the geologic timescale, rather than rehash opposition to its 4.55 billion years. The amount of time has changed before and may change again, but the structure that generates the time stays the same. Another benefit of this approach will be the correction of the misimpression that the timescale is nothing more than an empirical compilation of the rock record.

As presented by modern stratigraphers, the geologic timescale (Figure

1) is "the framework for deciphering the history of the Earth" (Gradstein, 2004, p. 3). That definition is aimed at professional stratigraphers, so I would expand it to: "a global standard for correlating the various rock units of the Earth's crust by means of standardized time periods derived from a combination of relative and absolute dating methods." It is a complex construct with overlapping (and not always consistent) layers of assumptions and an ever-growing list of methods. In Part II of this series I will revisit its development (cf. Mortenson, 2006), revealing its seminal axiom. This first part will explore how the timescale is an integral part of the worldview of naturalism.

The Man Behind the Curtain

Suffice it to say, any Christian should approach the timescale skeptically, recognizing: (1) that the Bible is also "a framework for deciphering the history of the Earth," and (2) that advocates of the timescale are strongly biased against the Bible. That is because any "framework" for earth history is ultimately an

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[illegible]

Figure 1. The most recent version of the geological timescale. Modified from Gradstein et al. (2004).

interpretation based on an underlying worldview. Conflicting “frameworks” represent conflicting worldviews, and those conflicts must be resolved at an axiomatic level.

Some people mistakenly believe that the timescale is inherent to the rocks. Like Aaron’s story of the golden calf, they think the timescale just popped out of the fire of geologic investigation. But even its definition reveals its role as a template, distinct from the rocks. That is why Reed and Froede (2003) suggested using different terms to distinguish the *empirical* “rock record” from the conceptual “geologic column.” Unfortunately, few creationists seem inclined to think that way, accepting the timescale on the empirical terms offered by its proponents (cf., Reed and Oard, 2006).

That is unfortunate because the blurring of the empirical and conceptual and of “science” and “history” is a significant Enlightenment error—strangely one that is more easily recognized and debunked when the topic is evolution. For some inexplicable reason, that critique (e.g., Johnson, 1991; 1993; 1995) has not been applied to geology, even though the timescale exhibits the same philosophical errors. Since advocates of naturalism posit a “prehistory” open only to forensic investigation, they equate science and history. Thus, secular geologists are consistently wrong when they present the timescale as no more than a systemized collection of worldwide observations of data. Creationists who do the same are both wrong and inconsistent:

So, the heart of the debates about the age of the earth and about how to correctly interpret the geological record is a massive worldview conflict (Mortenson, 2006, p. 16, emphasis added).

An understanding of the history of the timescale helps us recognize its philosophical roots. Though the worldview conflict was muted in the early years of geology, it was plain enough at the time of Lyell. At the heart of the

“new geology” was the conscious rejection of Noah’s Flood and the reliability of Scripture (Mortenson, 2004). Early uniformitarians disguised their intentions in public, but their strategic aims were clear in their private correspondence, typified in a letter written by Lyell in 1830.

I am sure you may get into Q.R. [*Quarterly Review*] what will free the science [of geology] from Moses, for if treated seriously, the [church] party are quite prepared for it. A bishop, Buckland ascertained (we suppose [Bishop] Sumner), gave Ure a dressing in the *British Critic and Theological Review*. They see at last the mischief and scandal brought on them by Mosaic systems.... Probably there was a beginning—it is a metaphysical question, worthy of a theologian—probably there will be an end. Species, as you say, have begun and ended—but the analogy is faint and distant. Perhaps it is an analogy, but all I say is, there are, as Hutton said, ‘no signs of a beginning, no prospect of an end’.... All I ask is, that at any given period of the past, don’t stop inquiry when puzzled by refuge to a ‘beginning,’ which is all one with ‘another state of nature,’ as it appears to me. But there is no harm in your attacking me, provided you point out that it is the proof I deny, not the probability of a beginning.... I was afraid to point the moral, as much as you can do in the Q.R. about Moses. Perhaps I should have been tenderer about the Koran. Don’t meddle much with that, if at all.

If we don’t irritate, which I fear that we may (though mere history), we shall carry all with us. If you don’t triumph over them, but compliment the liberality and candour of the present age, the bishops and enlightened saints will join us in despising both the ancient and modern physico-theologians. It is just the

time to strike, so rejoice that, sinner as you are, the Q.R. is open to you.

P.S. ...I conceived the idea five or six years ago [1824–25], that if ever the Mosaic geology could be set down without giving offence, it would be in an historical sketch, and you must abstract mine, in order to have as little to say as possible yourself. Let them feel it, and point the moral (Lyell, 1881, I:268–271, brackets added, as cited by Mortenson, 2006, pp. 17–18).

These are clearly not the words of a neutral purveyor of scientific truth, and coming from the founder of the “new geology,” they cast the pall of bias on his work as well as that of his successors. Lyell was an enthusiastic proponent of the geological column and its old-earth timescale; which lay at the center of the geological revolution. The timescale is far more than an empirical compilation of European geology—uniformitarians of the nineteenth century were not only biased against the Bible, but acted with malice aforethought.

The timescale can only be one and the same with the rocks if they come labeled in the field. In that case, there would be no need for stratigraphy or stratigraphers (see Reed et al., 2006a). But the rocks require interpretation, and the non-empirical foundations of the timescale are again revealed in a simple syllogism:

1. The timescale presents history.
2. History requires philosophy.
3. Philosophy requires and implies a worldview.
4. Therefore, the timescale requires and implies a worldview.

As we have seen, that worldview is not biblical Christianity.

Is this syllogism valid? The timescale is the summation of natural history. Contrary to those who see natural history as a purely scientific enterprise, *the investigation of unique past events is history* (Adler, 1965). Despite the efforts of Enlightenment philosophers and

their intellectual heirs to lump as much knowledge as possible under the umbrella of “science,” the true categories of knowledge are not so easily displaced. However, two centuries of this “big lie” have caused considerable confusion. Even many creationists do not see this error; opting for a watered-down appeal to “operations” vs. “origins” science—a definition without a distinction. The real error is resolved only by recognizing a clear demarcation between science and history. Thus, contrary to the claims of modern secularists (and the acquiescence of too many Christians) natural history is not science *per se*; it is a subset of history, distinguished by its goals and methods from human history. Science is not the arbiter of natural history; it is its forensic servant and natural history is thus a “mixed question” (Adler, 1965; Reed, 2000; 2002; Reed and Froede, 2003; Reed et al., 2006a; 2006b).

Since natural history and the geologic timescale present history, then they are inextricably tied to philosophy (whether modern practitioners like it or not), since history rests on philosophical underpinnings. As Clark (1994) explained:

History requires philosophy. Not only is the need for philosophy seen in the earlier difficulties and puzzles, but it is also seen, where some people do not expect it, in the very definition of history... Implicit in their formulations are their views of man, of society, of God, and therefore of knowledge... whatever his definition and extended views of history are, there must always be an underlying and controlling philosophy. It can be ignored, but it cannot be avoided. (pp. 21–22.)

These inherent and necessary philosophical assumptions are neon signs advertising the presence of a worldview at the foundation of the timescale, and it takes little effort to identify that worldview as atheistic naturalism. In that respect, uniformitarianism and its timescale are

no different than evolution and its icons. It is a view of history that dismisses the creative and providential works of God in history and denies His revelation of those acts in the Bible. Thus, if creationists do not recognize and attack this foundation, the timescale will remain relatively intact and the inhabitants of its ivory tower will remain undisturbed.

Like biologists who think evolution is “pure science,” most modern geologists are indignant that the timescale should be thought as anything less. They believe that they can point to an outcropping layer, a well log deflection, or a seismic reflector and identify each one as “Jurassic” or “Silurian” or “Proterozoic.” Their ability to perceive a particular stratum masks the questionable set of hidden assumptions that enables the *conceptual* transformation of that tangible rock into intangible history and the worldview inherent in it. As this series proceeds, the non-empirical aspects of the timescale will become more and more evident.

Creationist Responses

Creationists have shown a wide range of response to the timescale, but the majority opinion (i.e., Snelling et al., 1996) seems to be an acceptance of its structure—globally correlated rocks units corresponding to historical intervals (e.g., Cambrian, Cretaceous, Carboniferous)—coupled with a rejection of its absolute dates for those intervals. Even that position is a minority view among Christian intellectuals. Most, notably ID advocates, accept both the framework and the absolute age (while vigorously fighting its philosophical twin, Darwinism).

Others have rejected both ages and structure (e.g., Froede, 1995; Reed et al., 2006b; Walker, 1994; Woodmorappe, 1981; 1983). They recognize that stripping the column of its 4.55 billion year chronology is akin to cutting the rattles off of a live rattlesnake—they might be making the most noise but are not

the end you should worry about. Deep time is only a part of the problem; the framework that enables deep time also ensures that the Flood is defined by a non-biblical version of history when it is considered at all. Another danger of creationists accepting the general structure is that they (like uniformitarians) fail to see a distinction between the empirical rock record and the conceptual column—an error that exacerbates the confusion between science and history.

Even those creationists who reject the column’s structure usually keep their arguments on an empirical plane (e.g., Oard, 2006). The most comprehensive of these are those of Woodmorappe (1981; 1983), who demonstrated that the actual arrangement of the time units in the field does not approach the ideal of the timescale. Most empirical critiques by creationists examine local problems in correlation; the most common being out-of-order strata. The timescale has proven remarkably resistant to these assaults because the few empirical contraries cited are overwhelmed by a multitude of empirical studies that supposedly affirm the column elsewhere. Besides, empirical contraries can never dislodge a conceptual construct.

This series will not focus on these empirical particulars but will concentrate instead on assumptions and methods behind the timescale. If nothing else, this will clarify the foundational role of naturalism. Diluvial geology cannot prosper until it discredits the uniformitarian history that denies the biblical record. Since the timescale is a trans-empirical construct, our examination must move away from the empirical and go straight to that error. Only then can we restore biblical primacy in history and a proper understanding of Creation and the Flood.

Conclusion

The geologic timescale is much more than the compilation of the boundaries

of various empirical rock units. It is an alternate history; one without Creation or the Flood. Even if we strip away the absolute time, a framework remains that has been built on a foundation of naturalism. Most creationists have framed their critiques empirically. These not only fall short of the source of the error, but have been unable to create a consensus among creationists. That failure is another indication that the issue lays outside the boundaries of science. The following parts of this series will identify and critique assumptions, which will in turn reveal logical flaws in the stratigraphic methods that support today's timescale. Until we uproot the foundations, it will remain an imposing obstacle to any diluvial model.

References

- CRSQ: *Creation Research Society Quarterly*
- Adler, M.J. 1965. *The Conditions of Philosophy*. Atheneum Books, New York.
- Clark, G. 1994. *Historiography: Secular and Religious*. The Trinity Foundation, Jefferson, MD.
- Froede, C.R., Jr. 1995. A proposal for a creationist geological timescale. *CRSQ* 32:90–94.
- Gradstein, F.M. 2004. Introduction. In Gradstein, F.M, J.G. Ogg, and A.G. Smith (editors). *A geologic time scale 2004*. Cambridge University Press, Cambridge, UK.
- Gradstein, F.M, J.G. Ogg, and A.G. Smith (editors). 2004. *A Geologic Time Scale 2004*. Cambridge University Press, Cambridge, UK.
- Johnson, P.E. 1991. *Darwin on Trial*. Regnery Gateway, Washington, D.C.
- Johnson, P.E. 1993. Creator or blind watchmaker? *First Things*, January, 1993:8–14. Downers Grove, IL.
- Johnson, P.E. 1995. *Reason in the Balance*. InterVarsity Press, Downers Grove, IL.
- Mortenson, T. 2004. *The Great Turning Point*. Master Books, Green Forest, AR.
- Mortenson, T. 2006. The historical development of the old-earth geological time-scale. In Reed, J.K. and M.J. Oard (editors). *The Geologic Column: Perspectives within Diluvial Geology*, pp. 7–30. Creation Research Society Books, Chino Valley, AZ.
- Oard, M.J. 2006. The geological column is a general Flood order with many exceptions. In Reed, J.K. and M.J. Oard (editors). *The Geologic Column: Perspectives within Diluvial Geology*, pp. 99–119. Creation Research Society Books, Chino Valley, AZ.
- Reed, J.K. 2000. Historiography and natural history. *CRSQ* 37(3):160–175.
- Reed, J.K. 2001. *Natural History in the Christian Worldview*. Creation Research Society Books, Chino Valley, AZ.
- Reed, J.K. 2002. Evidence for, conflict over, and confidence in creationist models of earth history. *CRSQ* 38(4):213–215.
- Reed, J.K. and C.R. Froede, Jr. 2003. The uniformitarian stratigraphic column—shortcut or pitfall for creation geology. *CRSQ* 40:21–29.
- Reed, J.K., P. Klevberg, and C.R. Froede, Jr. 2006a. Towards a Diluvial Stratigraphy. In Reed, J.K. and M.J. Oard (editors). *The Geologic Column: Perspectives within Diluvial Geology*, pp. 31–51. Creation Research Society Books, Chino Valley, AZ.
- Reed, J.K., P. Klevberg, and C.R. Froede, Jr. 2006b. Interpreting the Rock Record without the uniformitarian geologic column. In Reed, J.K. and M.J. Oard (editors). *The Geologic Column: Perspectives within Diluvial Geology*, pp. 123–143. Creation Research Society Books, Chino Valley, AZ.
- Reed, J.K. and M.J. Oard (editors). 2006. *The Geologic Column: Perspectives within Diluvial Geology*. Creation Research Society Books, Chino Valley, AZ.
- Snelling, A.A., M. Ernst, E. Scheven, J. Scheven, S.A. Austin, K.P. Wise, P. Garner, M. Garton, and D. Tyler. 1996. The geological record. *Creation Ex Nihilo Technical Journal* 10(3):333–334.
- Walker, T. 1994. A Biblical geologic model. In Walsh, R.E. (editor). *Proceedings of the Third International Conference on Creationism*. Technical symposium sessions. pp. 581–592. Creation Science Fellowship, Pittsburgh, PA.
- Woodmorappe, J. 1981. The essential non-existence of the evolutionary-uniformitarian geologic column: a quantitative assessment. *CRSQ* 18:46–71.
- Woodmorappe, J. 1983. A Diluviological treatise on the stratigraphic separation of fossils. *CRSQ* 20:133–185.



Book Review

A Student's Guide to Natural Science

by Stephen M. Barr

Intercollegiate Studies Institute Books, Wilmington, DE, 2006,
86 pages, \$8.00.

The natural sciences include physics, astronomy, geology, chemistry, and biology. Author Barr has “chosen to emphasize physics and, to a lesser extent, astronomy” for one reason, because “the laws of physics govern the processes studied in all the other branches” (pp. 1–2). Also, as a physicist on faculty of the University of Delaware, he is best qualified in this field.

The “ISI Guides to the Major Disciplines” are reader-friendly introductions to the most important fields of knowledge in the liberal arts. Written by leading scholars for both students and the general public.” Each book has a “historical overview,” the discipline’s “central ideas,” and evaluations of “the works of thinkers whose ideas have shaped our world” (back cover). The series includes 14 books covering such disciplines as philosophy, literature, history, economics, religious studies, and law.

The contents of *Natural Science* include “The Birth of Science,” “Science, Religion, and Aristotle,” “Newtonian Physics,” “The Twentieth-Century Revolutions in Physics,” “The Role of Symmetry,” and “The Unreasonable Effectiveness of Mathematics.” The final chapter ends on p. 74 with an engaging quotation from Hermann Weyl, presented in a 1931 lecture at Yale University:

Many people think that modern science is far removed from God... But in our knowledge of physical nature we have penetrated so far that we can obtain a vision of the flawless harmony which is in conformity with sublime reason.

At the end of *Natural Science* are pages of notes and suggested reading, the most recent reference being 2005. The list includes references under group titles including astronomy, geology, chemistry, biology, and philosophy.

I have had a strong background studying and teaching science for more than half a century, and I enjoyed reading this little book. Today, unfortunately, most scientists align themselves with an atheistic philosophy, and they blame the Christian church for its imagined hostility to science. Barr helps to emphasize the true historical conditions:

The idea that the church establishment has been implacably hostile to science is a myth created to serve the purposes of antireligious and anticlerical propaganda. In fact, the church has always esteemed scientific research—even at the time of the Galileo affair (p. 14).

I anticipate that a wide spectrum of readers, starting at the high school level, will profit from reading this book.

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CRSQ

Water Gaps in the Alaska Range

Michael J. Oard*

Abstract

Two of the six water gaps through the Alaska Range will be briefly described. These water gaps fit in with a worldwide pattern of well over one thousand water gaps. Water gaps are a major mystery to uniformitarian geology. The three main uniformitarian hypotheses for the origin of water gaps will be analyzed and found wanting. There does not appear to be any evidence for either of the two hypotheses suggested for the origin of the Alaska Range water gaps. However, the Flood paradigm successfully explains these water gaps, as well as practically all others, and even wind gaps. Both wind and water gaps could have been rapidly carved during the Channelized Flow Phase of the Flood, when strong water currents were flowing perpendicular to mountains or ridges. An analog for a water and wind gap occurred during the gigantic Lake Missoula flood at the peak of the Ice Age.

Introduction

Water gaps are another of the many uniformitarian mysteries of geomorphology (Oard, 2008), which is the study of the features of the earth's surface. Present processes over millions of years are invoked to explain these water gaps, and several hypotheses have been invented. Not only is it difficult to prove them; there is also evidence against them. This paper will describe the Alaska Range water gaps, especially the more assessable Nenana and Delta water gaps, and relate them to water gaps found worldwide. It will be shown that the Genesis Flood provides a reasonable mechanism for their formation.

A water gap is: "A deep pass in a mountain ridge, through which a stream flows; esp. a narrow gorge or ravine cut through resistant rocks by an antecedent stream" (Bates and Jackson, 1984, p. 559). In other words, a water gap is a perpendicular cut through a mountain range, ridge or other structural barrier. This definition of a water gap unfortunately includes the mechanism of an "antecedent stream," which is: "A stream that was established before local uplift began and incised its channel at the same rate the land was rising; a stream that existed prior to the present topography" (Bates and Jackson, 1984, p. 22). This is the case of a hypothesis intruding on observations: the definition

presupposes that water gaps are created by streams that eroded down precisely at the same rate as tectonic uplift. A definition of a geological feature should be purely descriptive *without* speculation concerning its origin. Furthermore, a search of the literature demonstrates that uniformitarian scientists claim *five* possible mechanisms for the formation of water gaps, only one of which is an antecedent stream or river.

Wind gaps are related to water gaps, but are not eroded deeply enough to sustain present day water flow (Figure 1). A wind gap is: "A shallow notch in the crest or upper part of a mountain ridge, usually at a higher level than a water gap" (Bates and Jackson, 1984, p. 559). The notch in a ridge has to be an *erosional* notch, not a notch caused by faulting or some other mechanism. In other words, the entire ridge was once near the same altitude, until a notch

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Figure 1. Cumberland Wind Gap in the Appalachian Mountains along the Virginia/ Kentucky border near Middlesboro, Kentucky (view northwest from highway 58). This notch has been eroded down nearly 1,000 feet (300 m), as measured on the northeast side (Rich, 1933).

was eroded across its top. A wind gap is considered an ancient or incipient water gap, thought to have formed either when the sediments were thicker in the surrounding valleys or before the ridge had uplifted, if the ridge is a fault block. Uniformitarian geologists believe that wind gaps were initially cut by a stream or river. Then following either valley erosion or mountain uplift, the stream flowing through the ancient water gap was diverted and its course through the ridge abandoned. So, the wind gap was left at a higher altitude than the adjacent valley, which is why no stream or river flows through it today. Only wind passes through the gap now, which is why it is called a *wind* gap.

The Alaska Range Water Gaps

The Alaska Range (Figure 2) is an arc-shaped, generally east-west mountain range 600 miles (965 km) long in southern Alaska. It merges with the Wrangell and St. Elias Mountains on the east and the Aleutian Range on the west (Wahrhaftig, 1958). The highest mountain in North America, Denali (formerly Mount McKinley) at 20,135 ft (6,194 m), lies within the western Alaska Range. Most mountains are much lower with the crest of most of the range averaging between 7,000 and 9,000 ft (2,135 and 2,745 m) high. The lowlands north and south of the range are at low altitudes. The Tanana

Basin to the north is a broad, swampy lowland with average elevation between 395 to 820 ft (120 and 250 m) asl (Bemis, 2004).

Six rivers rise in the lowlands *south* of the range and flow northward across the range in water gaps to empty into the Yukon or Tanana River (Thornbury, 1965). These rivers are located at semi-regular intervals of 25 to 100 miles (40 to 160 km) apart (Wahrhaftig, 1965), and from west to east they are the Nenana, Delta, Nabesna, Chusana, Beaver, and White Rivers. The northwest foothills are a series of parallel east-west ridges, caused by folding and thrusting, and separated by long narrow valleys (Bemis, 2004). Just as mysterious, the drainage



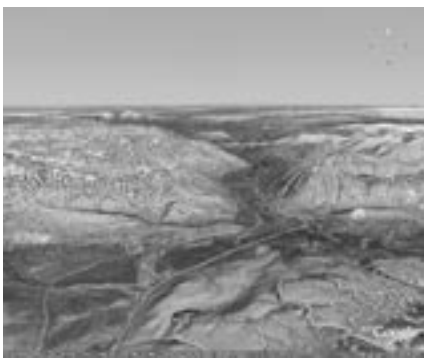
Figure 2. Shaded relief map of Alaska. The Alaska Range (arrow) is the arc-shaped mountain range that extends from southwest Cook Inlet to near the Alaska-Canadian border. (From U. S. Geological Survey.)

is even perpendicular to these ridges and valleys:

Strangely enough, the drainage does not follow these valleys but has a dendritic pattern roughly at right angles thereto, the rivers cutting directly across ridges and valleys alike (Wahrhaftig, 1958, p. 52).

In fact, the drainage of the rivers and tributaries is remarkably straight and parallel through these ridges (Wahrhaftig and Black, 1958). The origin of this drainage pattern is a puzzle.

The Nenana River is the first water gap to the west (Figure 3 and 4). The main highway (George Parks Highway or Highway 3) from Anchorage to Fairbanks passes through this water gap, which is only 2,363 ft (720 m) asl. The next water gap to the east is the water gap of the Delta River in which the Richardson Highway (Highway 4) and the Trans-Alaska pipeline pass through (Figures 5 and 6). Both water gaps pass through a generally low area in the Alaska Range. How did such water gaps form?



above: Figure 3. The Nenana water gap through the Alaska Range, view north, which is the same direction the river flows (permission from Google Earth™ mapping service).

right: Figure 4. Nenana water gap (view north) from Denali Highway just southwest of Cantwell, Alaska.



Water Gaps Worldwide

One would think that such transverse drainage through a mountain range would be rare, but it is not. Water gaps are found worldwide. For instance, there are numerous water gaps, small and large in the western United States.

In numerous places, especially in the Southern and Middle Rockies, rivers cut across uplifts cored by resistant

rocks in preference to what appear to be more logical courses on softer rocks around the uplifts (Madole et al., 1987, p. 213).

The Grand Canyon is a one-mile-deep (1.6 km) water gap. The Colorado River flows through several plateaus, the highest of which is the Kaibab Plateau, more than 9,000 ft (2,745 m) high. The origin of this water gap has been an enigma for a long time. Both uniformitarians and creationists have struggled to explain its origin (Young and Spamer, 2001). The uniformitarian hypotheses seem hopelessly muddled.

There are 300 water gaps in the Zagros Mountains of western Iran alone, creating gorges up to 8,000 ft (2,440 m) deep (Oberlander, 1965). These mountains rise up to 15,000 ft (4,575 m) above sea level, and are 1,000 miles (1,600 km) long and about 150 miles (240 km) wide. The Zagros Mountains are “very young” geologically (Pliocene) and little modified by erosion, which means that the water gaps are even “younger.” The lower walls of some water gaps are near vertical, sometimes overhanging. The

most impressive aspect of the Zagros drainage is that the streams and rivers appear to *shun valleys* and prefer to *transect mountains*—numerous times.

The Zagros drainage pattern is distinctive by virtue of its disregard of major geological obstructions, both on a general scale and in detail... Certain streams ignore structure completely; some appear to “seek” obstacles to transect; others are deflected by barriers only to breach them at some point near their termini. Many streams cut in and out of anticlines without transecting them completely, and a few cross the same barrier more than once in reverse direction (Oberlander, 1965, pp. 1, 89, quotes his).

There are probably well over 1,000 water gaps across the earth.

Since these early studies [in the late 19th century] transverse drainage has [sic] been identified from most major mountain belt regions around the world... (Stokes and Mather, 2003, p. 61).

So, the Alaska Range water gaps are not unusual, but part of a common worldwide pattern.

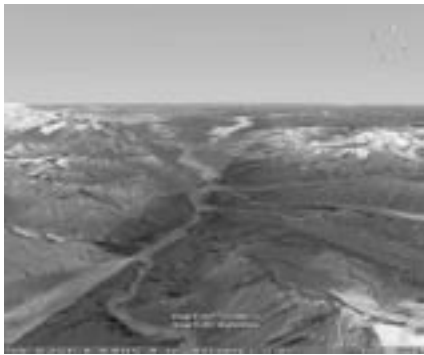


Figure 5. Delta River water gap through the Alaska Range, view north north-west, which is the direction of river flow (permission from Google Earth™ mapping service).



Figure 6. Delta River water gap (view north from Black Rapid Viewpoint).

Water Gaps— A Major Mystery of Uniformitarian Geology

The origin of water gaps is mysterious within the uniformitarian paradigm (Oard, 2001; 2007; 2008). Crickmay (1974) noted that rivers seem to cut water gaps as if there were no mountain barrier.

Admittedly a fascinating picture, a river runs over low, open plains directly towards seemingly impassable mountains but, undiverted by their presence, passes through them by way of a narrow defile, or water gap, to a lower region beyond. (p. 154.)

How could this have happened? Summerfield (1991) states that such

discordant drainage is especially common in fold mountains.

One of the most perplexing problems of drainage development to unravel is that provided by **transverse drainage**. Such a drainage pattern, which is also known as **discordant drainage**, occurs when river channels cut across geological structures ... Such drainage, which is common in fold mountain belts, is often regarded as anomalous, although this is not really an appropriate description. (p. 411, emphasis in original.)

Why should a river or stream flow through a barrier and not pass around it? Like canyons, uniformitarians assume a river erosion origin simply because a river is presently flowing through the gap. They ignore the possibility that some other mechanism could have cut the gap first and then the river simply followed the easiest route afterwards. Their reasoning is compromised by their commitment to uniformitarianism (or actualism), and their ideas, though plentiful, are poorly supported by observation, as will be shown below.

It is important to realize that not all water gaps are mysterious. Water gaps are only a puzzle when the river or stream could have more easily flowed around the ridge or mountain, but instead ended up cutting through the barrier. For example, the Columbia River Gorge between Oregon and Washington is a major water gap through the Cascade Mountains, but it runs through one of the lowest paths through the Cascade Mountains. Presumably when the mountains were lower and/or the rocks in eastern Washington and Oregon higher, the drainage would have already been established.

Despite Hypotheses, Origin of Water Gaps Unknown

Although there are five hypotheses for the origin of water gaps, only three are considered significant: 1) the anteced-

ent stream model, 2) the superimposed stream model, and 3) stream piracy (Austin, 1994; Stokes and Mather, 2003; Williams et al., 1991; 1992).

The Antecedent Stream Hypothesis

The antecedent stream hypothesis requires a river to be flowing in a set course prior to uplift of a landscape of low relief. Then a barrier, such as a mountain range, is uplifted in the path of the stream, but the process is sufficiently “slow” so that the stream or river maintains its course by eroding the landscape as it rises (Figure 7). The antecedent stream hypothesis was probably the first hypothesis invoked to explain transverse drainage. John Wesley Powell assumed that antecedent streams had cut the Green River and Grand Canyon water gaps. Most geologists accepted Powell’s hypothesis for many years.

This theory applies mainly to large rivers because only they have enough erosive power to keep up with uplift (Ah-

ner, 1998). However, some investigators believe that any river erosion would be too slow relative to mountain building to cut valleys, and do not accept the model. Although Twidale (1976) disagreed with that assessment, he did admit that antecedent rivers or streams are rare.

In many cases, the antecedent stream hypothesis can be ruled out for a number of reasons. For instance, the water gaps in Wales are cut through “old” mountains (Small, 1978). The rivers would have to be even older, which seems impossible. So, the Wales water gaps are assumed to have originated by superimposition, since there is no other viable hypothesis.

In order to demonstrate antecedenence, one must usually prove that the river in question predates uplift—a very difficult task (Twidale, 1976). Then, uplift must be slow enough not to deflect the river’s course (Ranney, 2005). This special conjunction of time and erosion would be unusual, especially over a long period of time. If the river is flowing through an



Figure 7. Block diagram showing the antecedent stream hypothesis. The stream is first established. Then the ridge slowly uplifts while the stream is able to erode through the barrier.

enclosed basin and the mountains rise too fast, a lake should form upstream of the barrier, but lake deposits are rarely if ever found. The chance of creating one water gap is low; creating multiple aligned gaps seems astronomical. The antecedent stream hypothesis appears to be a very simplistic explanation with little or no evidence. Sometimes, this idea is put forward simply because any other alternative is even more improbable (Small, 1978).

Geologists have recognized this, and many “antecedent stream” water gaps have been “reinterpreted,” suggesting that there was little or no evidence for antecedence in the first place. For instance, the water gaps on the Laramie, Arkansas, North Platte, and South Platte Rivers in the east central Rockies, once attributed to antecedent streams, are now considered products of superimposed streams (Short and Blair, 1986). Twidale (2004, p. 193) noted the difficulty of demonstrating the possibility of the antecedence hypothesis.

It is fair to state that though many rivers of tectonically active regions are probably of such an origin [antecedence], but like warping in relation to river capture, it is difficult to prove. The ages of the river and of the implied tectonism have to be established, and this is rarely possible.

Thus, the antecedent stream hypothesis faces these difficulties:

- It is now considered a minor contributor to water gaps
- Streams must predate uplift
- Geologists must prove that the mountains were uplifted, instead as a result of erosion
- Uplift must have been slow enough not to deflect the stream’s original course
- General absence of expected upstream lake deposits
- Hypothesis has been rejected in many cases upon further study
- Aligned water gaps cannot be explained

The Superimposed Stream Hypothesis

Problems in the antecedent stream model led to the superimposed (sometimes referred to as *superposed*) stream hypothesis. But, this model seems to have just as many problems. A superimposed stream or river is defined as: “A stream that was established on a new surface and that maintained its course despite different lithologies and structures encountered as it eroded downward into the underlying rock” (Bates and Jackson, 1984). In this hypothesis, a landscape is buried by renewed sedimentation, usually caused by marine transgression. Then, a stream or river is established on the generally flat cover of sediments or sedimentary rock, called the “covermass.” As erosion takes place over millions of years, the stream erodes

downward, maintaining its course even upon encountering harder rock beneath the covermass. So, after millions of years the stream ends up flowing through the older structural barriers. At the same time, the rest of the cover mass is eroded, leaving behind a river flowing through ridges or mountains (Figure 8). Apparently, any evidence of a prior “covermass” is enough to convince geomorphologists of this hypothesis (Twidale, 2004).

Although geologists at first believed that the Rocky Mountain water gaps were caused by antecedent streams, they later embraced the superimposed stream hypothesis. But Hunt (1967) was skeptical:

However, the stream courses across the various ranges in the Rocky Mountains probably are not superimposed. Too much fill would have been required to bury the several mountain ranges, and too much erosion would have been required to remove that fill. (p. 272.)

There is rarely any evidence for such a thick covermass or its deposition by a prior transgression.

A major problem with superimposition is that the river must maintain the same course to cut into resistant formations, while at the same time meander enough to erode the covermass, leaving only the more resistant rocks at higher elevations (Crickmay, 1974, p. 155). Even if there was any evidence, the concept defies logic. Consequently, there is



Figure 8. Block diagram of the superimposed stream hypothesis. The stream maintains its same course as most of the covermass (top layer) is eroded. (Illustration drawn by Bryan Miller.)

rarely any evidence that water and wind gaps formed from superposed streams:

Although a plausible mechanism, superimposition is extremely difficult to verify except in the case of very young orogens [uplifted linear, folded, and deformed mountain belts] where vestiges of the original sedimentary cover remain. In ancient mountain belts, denudation will have removed all the evidence of any pre-existing sedimentary cover (Summerfield, 1991, p. 411, brackets added).

Even when erosional remnants of sediments are found, they do not automatically imply continuous coverage above the existing terrain. Since most of the strata have been eroded, it is in fact an argument from a lack of evidence, and therefore weak.

Thus, the superimposed stream hypothesis faces these difficulties:

- Absence of evidence for hypothetical transgressions and resulting covermass
- Rivers erode downward to cut structure, but covermass is eroded laterally
- Absence of evidence
- Erosional remnants do not prove original covermass
- Geometry demands incredibly large covermass in some cases
- Stream should be deflected and eroded downward from hard sediments into underlying and adjacent soft rock

The Stream Piracy Hypothesis

The third major hypothesis is called *stream piracy* or *stream capture* (Figure 9). Summerfield (1991, p. 410) explained: "River capture occurs when one stream erodes more aggressively than an adjacent stream and captures its discharge by intersecting its channel." The higher rate of erosion by the capturing stream can be attributed to: (1) a steeper gradient, (2) greater discharge, (3) less resistant rocks, and (4) higher precipitation.

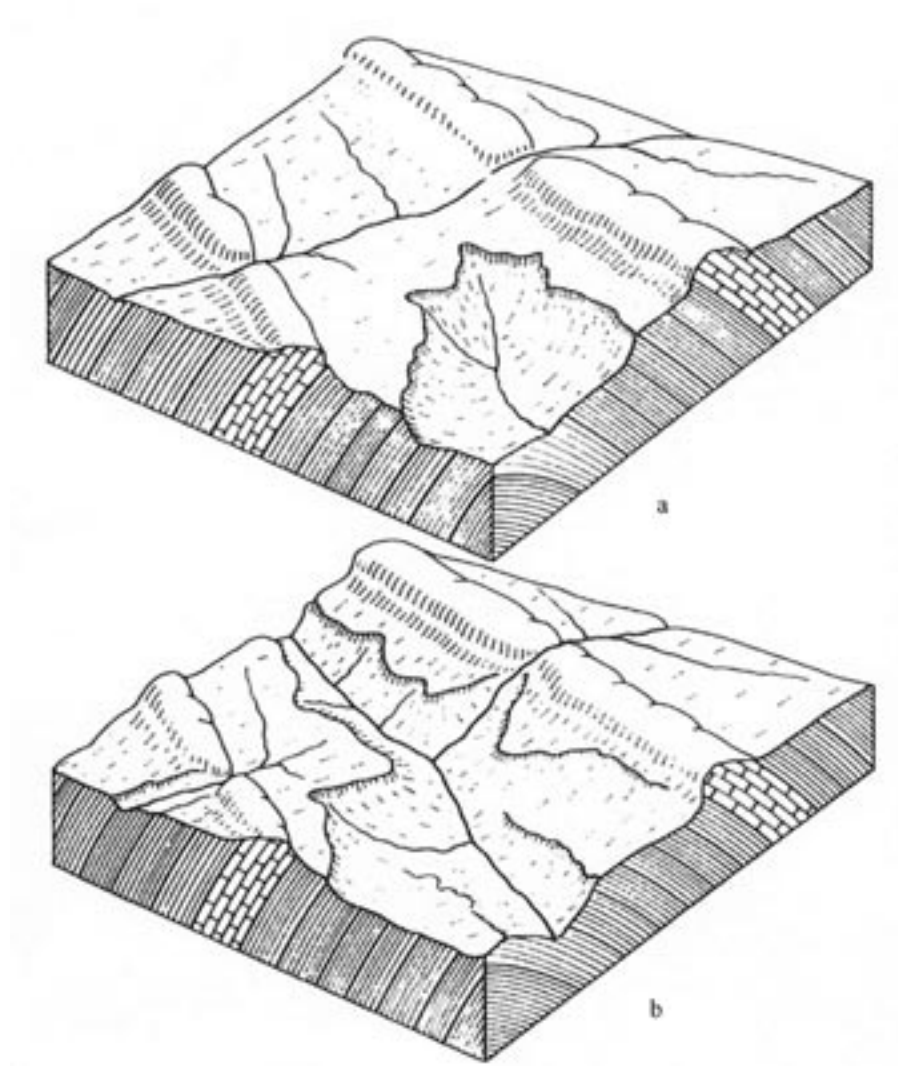


Figure 9. Block diagram of two stages of stream capture. (a) The stream on the lower right is rapidly eroding headward and captures the right portion of the other stream in (b). Modified from Summerfield (1991, p. 411).

Several lines of evidence are offered for this model (Small, 1978). One is the "elbow of capture," which is a sharp change in channel direction on the order of 90° or more. Another is a "misfit" stream—one which carries too much water or too little for its channel. Underfit streams, where flow is too small, are common. Overfit streams are those where flow is too large for the channel. Captured streams are underfit below the point of capture, and the "pirate" stream

becomes overfit past that point. Wind gaps, or "cols," are thought to be the abandoned portion of a stream captured long ago, especially when they contain exotic gravels.

The model is also supported by sudden gradient increases in river profiles, known as "knickpoints." A waterfall is an extreme example of a knickpoint. Geologists attribute the sudden change in slope to stream capture.

At first glance, these phenomena

seem to support the model. But an “elbow of capture” may be caused by geological factors such as faulting or changes in lithology. Not all sharp changes, even those in front of water gaps, are always attributed to capture, such as the Yar River on the Isle of Wight (Small, 1978). Likewise, misfit streams have other explanations. First, there is little or no evidence for overfit streams, which should be observed at any recent capture event. Dury (1964) demonstrated that virtually *all* streams in an area, whether presumed captured or not, are underfit. He considered this strong evidence against the capture hypothesis. Cols can also form in other ways (Small, 1978). The best evidence for flow through cols is the presence of exotic water-worn gravels. But these gravels cannot show whether a stream was captured, diverted, or simply dried up. Finally, knickpoints are also equivocal unless accompanied by other evidence because they can be caused by renewed regional uplift or a “young” stream that is still eroding headward.

The model seems simple enough given millions of years of denudation, yet reality is more complex. Many supposed examples have ignited disputes among geomorphologists (Small, 1978). If nothing else, the mechanism has been applied too liberally (Small, 1978). The origin of the transverse drainage of the Zambezi River in Africa was assumed to have been caused by river capture (Thomas and Shaw, 1992), but it has since been proposed that this instance of river capture was caused by a catastrophic flood from a breached paleolake.

In order to demonstrate stream piracy, it must be shown that the pirating stream was incised to a significantly lower level than its victim. But past erosional levels are often erased by ongoing active erosion.

Small (1978) stated that there rarely is direct evidence for stream piracy; it is an inference from general features: “It must be apparent from this discussion

that the phenomenon of river capture cannot be ‘taken on trust’ ” (p. 229). It seems impossible for stream piracy to account for aligned water gaps observed in some areas. Given the “bandwagon effect,” there may be many incorrect applications of the model.

Thus, the stream piracy model faces these difficulties:

- Other explanations exist for the “elbow of capture,” wind gaps, and knickpoints
- Overfit streams are nearly nonexistent
- Most streams are underfit
- It is hard to demonstrate historically deeper erosion by the pirating stream
- Aligned water gaps cannot be explained
- Evidence is often missing

Little, If Any, Evidence for Uniformitarian Hypotheses

In summary, there rarely is evidence for *any* of these uniformitarian hypotheses. One of them is simply invoked to provide some explanation for wind or water gaps. Any of them is preferable to no hypothesis at all. However, investigators rarely present compelling evidence. It is easy to understand how the different hypotheses come and go for a particular area.

Thomas Oberlander probably has studied water gaps more rigorously than anyone else. He has many sobering thoughts on past and present research. For instance, Oberlander (1965) noted the conjectural nature of explanations.

The question of the origin of geological discordant drainage has almost always been attacked *deductively*, leading toward conclusions that remain largely within the realm of *conjecture*. Accordingly, the anomalous stream courses are attributed to previous tectonic environment [antecedence], to superposition from *hypothetical* erosion surfaces or covermasses, or to headward

extension under largely *unspecified* controls [stream piracy]. (p. 1, emphasis and brackets added.)

Twenty years later, Oberlander (1985) expressed the same opinion.

Large streams transverse to deformational structures are conspicuous geomorphic elements in orogens [mountains] of *all ages*. Each such stream and each breached structure presents a geomorphic problem. However, the *apparent absence of empirical evidence* for the origin of such drainage generally limits comment upon it.... Transverse streams in areas of Cenozoic deformation are routinely attributed to stream antecedence to structure; where older structures are involved the choice includes antecedence, stream superposition from an *unidentified* covermass, or headward stream extension in some *unspecified* manner [piracy]. Whatever the choice, we are *rarely* provided with conclusive supporting arguments. (pp. 155–156, brackets and emphasis added.)

Given that all uniformitarian hypotheses are insufficient, we should wonder if the problem lies with the parent paradigm of uniformitarianism.

The Hypotheses Applied to the Alaska Range Water Gaps

Some have suggested that the water gaps through the Alaska Range and the northern foothills formed by antecedent drainage—the Alaska Range was uplifted through existing rivers which maintained their courses (Thornbury, 1965). The late Cenozoic uplift of the Alaska Range, about 5 to 6 million years ago within the uniformitarian timescale (Fitzgerald et al., 1995), could be considered evidence in favor of antecedence. But, geologists believe the drainage was established after the uplift. Without antecedence (stream piracy was not considered), Wahrhaftig and Black (1958) defaulted to superimposed streams. In their model, the folds and thrusts for at least

the northern foothills first formed ridges, then the whole area was covered with a flat “covermass,” and finally a drainage superimposed on this covermass carved downward into the ridges. Finally, the valleys were eroded. However, the streams and rivers are unexpectedly parallel, which is surprising since they would have had to meander extensively to erode the valleys (Wahrhaftig and Black, 1958; Wahrhaftig, 1965).

The water gaps of the Alaska Range are just as mysterious as the many other water gaps across the Earth. None of the uniformitarian models fit the evidence. Perhaps the answer is to explore outside the uniformitarian paradigm.

The Late Flood Origin of Water Gaps

Uniformitarian hypotheses for the formation of water and wind gaps are essentially speculative guesses with little, if any, supporting evidence. There are numerous problems with all three major hypotheses. A better explanation can be found by shifting paradigms and examining how catastrophic erosion during the late Flood can explain these features.

Did Water Gaps Form after the Flood?

Some creationists have suggested that some water and wind gaps were cut by post-Flood erosion during local catastrophic events, such as the dam-breach hypothesis for the origin of Grand Canyon (Austin, 1994; Brown, 2001). However, I believe that the evidence supports a late-Flood origin for these features.

Erosion from a catastrophic dam breach could create water and wind gaps. This has been suggested as the cause of anomalous drainage on the Zambezi River (Thomas and Shaw, 1992). The dam could have been rock or unconsolidated debris. In either case, it evidently gave way, much like the failure at Red Rock Pass and catastrophic flooding

down the Snake River from Ice Age Lake Bonneville in the Salt Lake basin in Utah (Oard, 2004a). The Bonneville flood is believed to have discharged 1,150 mi³ (4,750 km³) of water in eight weeks, dropping Lake Bonneville 354 ft (108 m) [O'Connor, 1993]. However, this flood did not appear to produce any water or wind gaps.

The Ice Age would have produced lakes dammed by ice sheets in North America, Europe, and Asia. Several of these show evidence of breaching by overtopping a bounding ridge, cutting a canyon and reversing the drainage of a river. Glacial Lake Agassiz in south-central Canada spilled over ridges at many locations (Oard, 2004a) that may have become water or wind gaps.

One of the largest ice age lakes was glacial Lake Missoula (Oard, 2004a). After this lake deepened to 2,000 ft (610 m) at the ice dam in northern Idaho, the ice burst, producing one of the largest floods since that of Genesis. Glacial Lake Missoula contained 540 mi³ (2,210 km³) of water and emptied in two days, sending a wall of water around 400 ft (120 m) deep across the Pacific Northwest, from Spokane, Washington to Portland, Oregon. It did produce one impressive water and wind gap, illustrating a mechanism for these features more plausible than any uniformitarian model.

Stream capture is also feasible after the Flood, especially by small streams and in areas where very little erosion would suffice to trigger capture. However, given the relative difference in erosion rates during and since the Flood, one would not expect significant stream piracy in the approximately 4,500 years since the Flood. During the post-Flood period, stream piracy should be rare, and any water gaps would be small.

A Flood Mechanism for Cutting Gaps

If few water or wind gaps have formed since the Flood, then they must have formed during the Flood. Since these

gaps appear to be among the final features formed in the geologic sequence of events, they must have been cut late in the Retreating Stage of the Flood. Uniformitarians recognize this relative timing and attribute water and wind gaps predominantly to the late Cenozoic. For instance, the 300 water gaps in the Zagros Mountains are believed to have been excavated during the late Cenozoic (Oberlander, 1965).

The Recessive Stage of the Flood can be divided into an early Sheet Flow Phase and a later Channelized Flow Phase (Walker, 1994). It is unlikely that any water gaps formed during the Sheet Flow Phase, because the widths of water gaps are much narrower than the sheetflow currents, which were probably very wide. But it is possible that notches could have been initiated in a mountain barrier or ridge by local variations in the sheetflow currents or by structural or lithological zones of weakness. These would have been subsequently enlarged during channelized flow. Regardless of when the initial notch developed, the large majority of water gaps, as well as wind gaps, probably formed during the Channelized Flow Phase.

As the currents became more laterally restricted, mountains and plateaus would have been rising above the retreating Floodwater. Currents would have been diverted into low areas or notches formed earlier. For a time, current velocities would have remained high enough to form water and wind gaps, and even large canyons.

Rapid Cutting of Water and Wind Gaps

Water and wind gaps, up to the size of valleys and canyons would have been rapidly cut during the Channelized Flow Phase. Because the base level for the recession of the Flood was the newly created ocean basins, currents would have often flowed perpendicular to mountains and hills, cutting through them instead of going around, forming

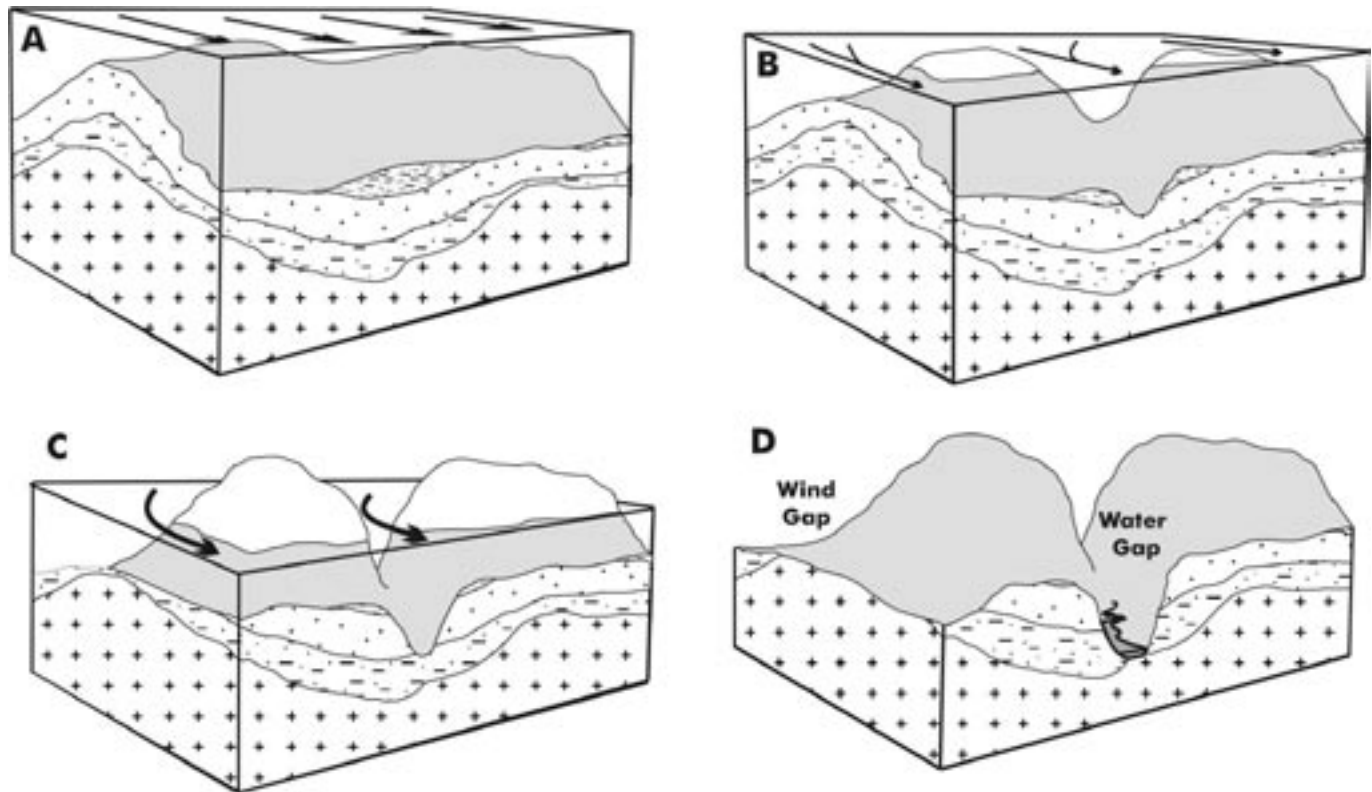


Figure 10. Series of schematics on the formation of water and wind gaps (drawn by Peter Kleberg). (A) Water flowing perpendicular to a transverse ridge forms shallow notches on the ridge. (B) Notches are eroded further as the water level drops below the top of the ridge. (C) Floodwaters continue to drain as notches deepen. (D) Floodwaters are completely drained with a river running through the lowest notch, the water gap. Insufficient erosion in the other notch left a wind gap.

valleys, canyons, and pediments (Oard, 2004b; 2007) [Figure 10a]. The high current velocity would have cut gaps directly through elevated topography. In many cases, overlying sediments would have been eroded too, like an accelerated version of the superimposed stream hypothesis.

Because these landscapes were created by a rapid hydraulic event, it is important to consider current variations, even during the sheetflow runoff (Schumm and Ethridge, 1994). These variations might have initiated notches at higher elevations. Lithological or structural weaknesses could also have been involved, although few water gaps are associated with faults. A fourth possibility is that the channelized flow cut gaps from notch to completion.

Regardless, once formed, the currents would have sped up through the notch relative to the surrounding flow (Figure 10b). Therefore, erosion would have accelerated with the current velocity. Abrasive sediment in the water would also have contributed to rapid erosion of the gaps (Figure 10). We can see the same phenomena today when a dam breaches. Once the water finds the point of failure, it rapidly cuts down, although parts of the dam may survive intact.

Wind gaps are found at higher elevations than the local drainage. They might be high because they were not cut to sufficient depth, either from a drop in water level or decrease in erosional energy. They may also have been uplifted too high. At any rate, they transport only wind today (Figure 10c,d).

Dynamic Flood processes could also account for some of the evidence attributed to stream capture, such as the elbow of capture; rounded, exotic gravels in wind gaps; and underfit streams. For example, an elbow of capture might have formed by shifts in a channelized current as it cut into a valley first in one direction, then another.

Another advantage of the Flood hypothesis is that it explains multiple, aligned gaps—a singular point of failure for the uniformitarian theories. A high-velocity Flood current would be flowing on a regional to megaregional scale. Thus, its momentum would easily carry it through multiple barriers, and the large size of the current would create aligned water or wind gaps in a series of perpendicular ridges, such as those observed in

the Appalachian Mountains of the eastern United States and the MacDonnell Ranges in central Australia.

A further evidence of rapid, abrupt formation of gaps is the youthful appearance of such features. They show little signs of later erosion. Crickmay (1933) stated that wind gaps have been modified little by weathering since they first formed. This is entirely consistent with the Flood explanation—the Channelized Flow Phase was the *last* event of the Flood and occurred only a few thousand years ago. This “youthfulness” is also an argument against the uniformitarian model; we would have to accept that wind gaps have remained untouched by erosion for millions of years.

The Example of the Lake Missoula Flood

Geomorphological evidence for the Recessive Stage of the Flood is strong (Oard, in press). Whereas uniformitarian geologists have to invent speculative secondary hypotheses to salvage their paradigm in the light of conflicting evidence, the Flood paradigm does not need to invent secondary hypotheses, because the evidence is consistent with the paradigm. Furthermore, the Lake Missoula flood offers the Flood paradigm an example of how a well-substantiated catastrophic flood at the peak of the Ice Age (Oard, 2004a) created a water and wind gap. The Lake Missoula flood (also called the Spokane or the Bretz flood) demonstrates that the catastrophic model works much better than any low-energy solution.

Despite its width of up to 100 miles (160 km), the Lake Missoula Flood possessed a current velocity of up to 65 mph (100 kph). There likely was only one major flood and possibly a few minor floods afterwards (Oard, 2003; 2004a). One major pathway was the Cheney-Palouse scabland tract in the eastern part of the flood path. The southern portion of this tract includes the upper portion of Washtucna Coulee. Prior to

the flood, the Palouse River rising from the mountains of northern Idaho flowed westward through this coulee and then into the Columbia River. The Snake River flows parallel to the Washtucna Coulee about 10 miles (16 km) south. There is a basalt ridge covered by about 100 ft (30 m) of the Palouse silt between the Snake River and Washtucna Coulee. This ridge is about 500 ft (150 m) above the Snake River.

The Lake Missoula flood rushed southward into the head of Washtucna Coulee. It overtopped the ridge between Washtucna Coulee and the Snake River at two locations, forming a water and wind gap (Figure 11). To the east, the width was initially around 8 miles (13 km), but the flow eventually formed a

a 90° left-hand turn and flowed through what is now called Palouse Canyon and into the Snake River. Palouse Canyon is therefore a water gap formed during the Lake Missoula flood. Palouse Falls (Figure 12) would then represent a “knickpoint.”

The Lake Missoula flood also breached the ridge between Washtucna Coulee and the Snake River 15 miles (24 km) west of Palouse Canyon. A narrow notch called Devils Coulee, 500 ft (150 m) deep was eroded through the ridge. However, the Lake Missoula flood did not erode this coulee deep enough at its entrance from Washtucna Coulee. The entrance to Devils Coulee is approximately 100 ft (30 m) above Washtucna Coulee, and no stream was

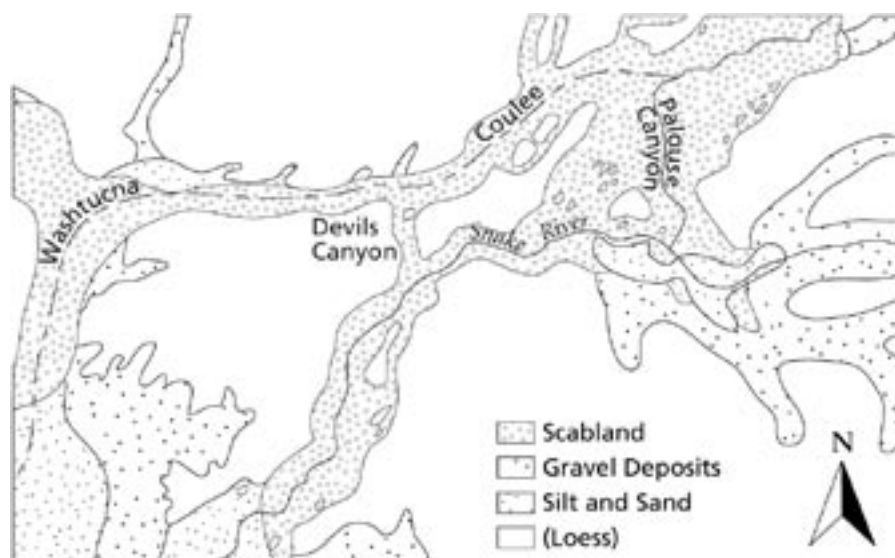


Figure 11. Map of ridge between Washtucna Coulee and the Snake River showing Palouse and Devils Canyons cut from the Lake Missoula flood. Modified from Bretz (1928, p. 205). (Drawing by Mark Wolfe.)

narrow, vertically walled canyon 500 ft (150 m) deep—down to the level of the Snake River. The narrow erosion likely was manifested as a “retreating waterfall.” After the flood, the Palouse River, instead of continuing its flow westward down Washtucna Coulee as before, took

diverted down Devils Coulee. So Devils Coulee remains a wind gap. Palouse Canyon and Devils Coulee, therefore, are examples of how large volumes of energetic floodwaters can rapidly excavate water and wind gaps in hard rock (Oard, 2003).



Figure 12. Palouse Falls on the Palouse River between Washtucna Coulee and the Snake River.

Summary

Six water gaps cut through the Alaska Range, as well as foothills north of the range. These features are similar to well over 1,000 water gaps across the earth, 300 alone in the Zagros Mountains of Iran. How a river could cut through a mountain range or ridge presents a

seemingly insurmountable challenge to uniformitarian geologists. It does not seem that an appeal to actualism would help. Of course, many hypotheses have been invented over the years—all with apparently fatal problems. Water and wind gaps can rapidly be cut during the Channelized Flow Phase of the Flood

by currents flowing perpendicular to mountains and ridges. An example of the cutting of a water and wind gap in a few days is provided by the Lake Missoula flood. Worldwide water and wind gaps, like other global geomorphological mysteries, point to a *global Flood*.

Acknowledgments

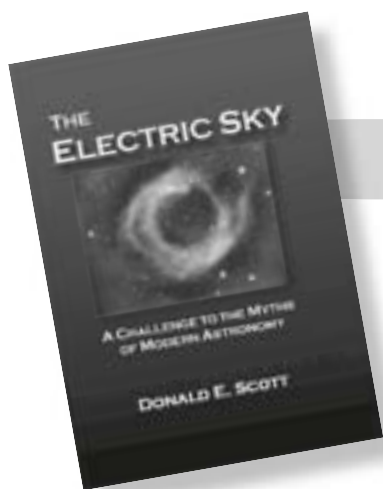
I thank Hank Giesecke for accompanying me during this trip to view the Nenana and Delta River water gaps in the Alaska Range. I also thank North Star Bible Camp of Willow, Alaska, for their generous hospitality in providing housing, meals and wheels for this study. I appreciate John Reed fine-tuning several of the figures. Finally, I thank Bryan Miller of Master Books for drawing Figure 8.

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References

- CRSQ: *Creation Research Society Quarterly*
- Ahnert, F. 1998. *Introduction to Geomorphology*. Arnold, London, UK.
- Austin, S.A. 1994. How was Grand Canyon eroded? In Austin, S.A. (editor). *Grand Canyon: Monument to Catastrophe*, pp. 83–110. Institute for Creation Research, Santee, CA.
- Bates, R.L. and J.A. Jackson (editors). 1984. *Dictionary of Geological Terms*, 3rd edition, Anchor Press/Doubleday, Garden City, NY.
- Bemis, S.P. 2004. *Neotectonic Framework of the North-Central Alaska Range Foothills*. M.S. thesis, University of Alaska Fairbanks, Fairbanks, AK.
- Bretz, J.H., 1928. Alternative hypotheses for Channeled Scabland. I. *Journal of Geology* 36:193–223.
- Brown, W. 2001. *In the Beginning: Compelling Evidence for Creation and the Flood*, 7th edition. Center for Scientific Creation, Phoenix, AZ.

- Crickmay, C.H. 1933. The later stages of the cycle of erosion: some weaknesses in the theory of the cycle of erosion. *Geological Magazine* 70:337–347.
- Crickmay, C.H. 1974. *The Work of the River: A Critical Study of the Central Aspects of Geomorphology*. American Elsevier Publishing Co., New York, NY.
- Dury, G.H. 1964. Principles of Underfit Streams—General Theory of Meandering Valleys. U. S. Geological Survey Professional Paper 452-A, Washington, D.C.
- Fitzgerald, P.G., R.B. Sorkhabi, T.F. Redfield, and E. Strump. 1995. Uplift and denudation of the central Alaska Range: a case study in the use of apatite fission track thermochronology to determine absolute uplift parameters. *Journal of Geophysical Research* 100(B10):20,175–20,191.
- Hunt, C.B. 1967. *Physiography of the United States*. W.H. Freeman and Company, San Francisco, CA.
- Madole, R.F., W.C. Bradley, D.S. Loewenherz, D.F. Ritter, N.W. Rutter, and C.E. Thorn. 1987. In Graf, W.L. (editors), 1987. *Geomorphic Systems of North America*, Geological Society of America Centennial Special Volume 2, pp. 211–257. Boulder, CO.
- Oard, M.J. 2001. Vertical tectonics and the drainage of Floodwater: a model for the middle and late diluvian period—Part II. *CRSQ* 38(2):82–83.
- Oard, M.J. 2003. Evidence for Only One Gigantic Lake Missoula Flood. In Ivey, R.L. (editor). *The Fifth International Conference on Creationism*, technical symposium sessions, pp. 219–231. Creation Science Fellowship, Pittsburgh, PA.
- Oard, M.J. 2004a. *The Missoula Flood Controversy and the Genesis Flood*. Creation Research Society Monograph No. 13, Chino Valley, AZ.
- Oard, M.J. 2004b. Pediments Formed by the Flood: Evidence for the Flood/post-Flood Boundary in the Late Cenozoic. *TJ* 18(2):15–27.
- Oard, M.J. 2007. Do Rivers Erode Through Mountains? Water Gaps are Strong Evidence for the Genesis Flood. *Creation* 29(3):18–23.
- Oard, M.J. 2008. *Flood by Design: The Earth's Surface—Shaped by Receding Water*. Master Books, Green Forest, AR (in press).
- Oberlander, T.M. 1965. *The Zagros Streams: A New Interpretation of Transverse Drainage in an Orogenic Zone*. Syracuse Geographical Series No. 1, Syracuse, NY.
- Oberlander, T.M. 1985. Origin of Drainage Transverse to Structures in Orogens. In Morisawa, M. and J.T. Hack (editors). *Tectonic Geomorphology*, pp. 155–182. Allen and Unwin, Boston, MA.
- O'Connor, J.E. 1993. *Hydrology, Hydraulics, and Geomorphology of the Bonneville Flood*. Geological Society of America Special Paper 274, Boulder, CO.
- Ranney, W. 2005. *Carving Grand Canyon: Evidence, Theories, and Mystery*. Grand Canyon Association, Grand Canyon, AZ.
- Rich, J.L. 1933. Physiography and Structure at Cumberland Gap. *GSA Bulletin* 44:1,219–1,236.
- Schumm, S. and F.G. Ethridge. 1994. Origin, Evolution and Morphology of Fluvial Valleys. In Dalrymple, R.W., R. Boyd, and B.A. Zaitlin (editors). *Incised-Valley Systems: Origins and Sedimentary Sequences*, pp. 11–27. SEPM Special Publication No. 51, Tulsa, OK.
- Short, N.M. and R.W. Blair, Jr. (editors). 1986. *Geomorphology from Space: A Global Overview of Regional Landforms*. NASA, Washington, D.C.
- Small, R.J. 1978. *The Study of Landforms: A Textbook of Geomorphology*, second edition. Cambridge University Press, London.
- Stokes, M. and A.E. Mather. 2003. Tectonic origin and evolution of a transverse drainage: the Río Almanzora, Betic Cordillera, Southeast Spain. *Geomorphology* 50:61.
- Summerfield, M.A. 1991. *Global Geomorphology*. Longman Scientific & Technical, New York, NY.
- Thomas, D.S.G. and P.A. Shaw. 1992. The Zambezi River: tectonics, climatic change and drainage evolution—is there really evidence for a catastrophic flood? A discussion. *Palaeogeography, Palaeoclimatology, Palaeoecology* 91:175–178.
- Thornbury, W.D. 1965. *Regional Geomorphology of the United States*. John Wiley & Sons, New York, NY.
- Twidale, C.R. 1976. *Analysis of Landforms*. John Wiley & Sons Australasia Pty Ltd, New York, NY.
- Twidale, C.R. 2004. River patterns and their meaning. *Earth-Science Reviews* 67:159–218.
- Wahrhaftig, C. 1958. The Alaska Range. In Williams H. (editor). *Landscapes of Alaska: Their Geological Evolution*. University of California Press, Los Angeles, CA.
- Wahrhaftig, C. 1965. Physiographic divisions of Alaska. U.S. Geological Survey Professional Paper 482, Washington D.C.
- Wahrhaftig, C. and R.F. Black. 1958. Quaternary and engineering geology in the central part of the Alaska Range. U.S. Geological Survey Professional Paper 293, Washington D.C.
- Walker, T. 1994. A Biblical geological model. In Walsh, R.E. (editor). *Proceedings of the Third International Conference on Creationism*, technical symposium sessions. Creation Science Fellowship, pp. 581–592. Pittsburgh, PA.
- Williams, E.L., J.R. Meyer, and G.W. Wolfrom, 1991. Erosion of Grand Canyon Part I—Review of antecedent river hypothesis and the postulation of large quantities of rapidly flowing water as the primary agent of erosion. *CRSQ* 28:92–98.
- Williams, E.L., J.R. Meyer, and G.W. Wolfrom. 1992. Erosion of Grand Canyon Part II—Review of river capture, piping and ancestral river hypotheses and the possible formation of vast lakes. *CRSQ* 28:138–145.
- Young, R.A. and E.E. Spamer (editors). 2001. *Colorado River Origin and Evolution: Proceedings of a Symposium held at Grand Canyon National Park in June, 2000*. Grand Canyon Association, Grand Canyon, AZ.



Book Review

The Electric Sky: A Challenge to the Myths of Modern Astronomy

by Donald E. Scott

Mikamar Publishing, Portland, OR, 248 pages, \$25.00.

The Electric Sky is an engaging, well-written review of the current state of plasma universe cosmology. The subject matter is tenable to all, from layperson to scientist, and puts forth a compelling, concise paradigm shift for the fields of astronomy and cosmology. This book is highly recommended for its references to seminal works in plasma cosmology, and for its electrical explanations for many stellar phenomena and astrophysical anomalies. The only possible improvement to this publication would be to touch up a number of pixelated images.

Professor Scott is a retired electrical engineering professor and amateur astronomer. He opens the book with powerfully condemning words regarding modern cosmology work, the first chapter of which is available on the web (thunderbolts.info). In the first six chapters, Scott confronts the inadequacies of current cosmological theories, notes the unwillingness of scientific leaders to accept alternative explanations, and provides a history of science, astronomy, and plasma research. The remainder of the book expounds upon the electrical nature of the universe, citing specific examples of experimentally verified phenomena. The closing chapters deal with the future of astronomy and how to build upon current findings in plasma science. Scott also provides a concise technical appendix of Birkeland cur-

rents, computation of redshifts, solar electron flux, and "An Open Letter to the Scientific Community" signed by many plasma research scientists.

Chapters 1–3 provide a brief overview of plasma in the cosmos, the history of science, and "Some 'Ugly Facts'" of cosmology. The blind acceptance of big bang cosmology (BBC) has forced mathematicians to invent many non-falsifiable, untestable entities. About the debut of "black holes" by Professor John Wheeler at Princeton University, Scott surmises that Professor Wheeler said, "You can't prove that black holes don't exist, so I am free to use the concept as often as I like" (p. 15). Other non-falsifiable entities listed include weakly interacting massive particles (WIMPs), strange matter, massive compact halo objects (MACHOs), and more. Scott claims these untouchable entities cover up the major flaws associated with BBC. This inadequate aspect of BBC is referred to repeatedly throughout the book, but with new examples pertaining to the current subject matter in every occurrence.

In chapter 4, the author gives a striking synopsis of how big space truly is. He refers back to the same telling picture (stars can be represented by "two specks of dust separated by $\frac{1}{4}$ of a mile") when refuting the use of "start collisions" by astronomers to account for binary pairs, gravitational effects, and other anoma-

lies. Chapter 5 deals specifically with the "Case of the Missing Matter." The universe is thought to be 98% "dark," which Scott surmises as the inability of astronomers to account for the mass needed to hold galaxies and the cosmos together according to an expanding BBC. Scott quotes Jim Peebles of Princeton University as saying that "it's an embarrassment that the dominant forms of matter in the universe are hypothetical" (p. 40). The author then quips that many forms of dark matter should be referred to as Fabricated Ad hoc Inventions Repeatedly Invoked in Efforts to Defend Untenable Scientific Theories: FAIRIE DUST. He continually reiterates the need to reassess a theory that is so well accepted but at the same time does not explain what we can physically test and observe. Chapter 6, entitled "Case of the Missing Neutrinos," discusses some observations that may disprove fusion as the sole source of power for the sun.

Chapter 7 moves into cosmology's roots, starting at ancient times and moving through the modern day, which the author claims is still using the tools of seventeenth-century Newtonian mechanics and fluid systems. Chapter 8 introduces the plasma pioneers Kristian Birkeland, Irving Langmuir, Hannes Alfvén, and Anthony Peratt. Chapter 9 ("Shake Hands with a Plasma") provides the reader with an introduction to plasma science, electrical charge,

voltage, capacitance, and plasma frequency. While it is taught the universe is electrically neutral, a main tenant of plasma science is that the universe is filled with charged particles in magnetic domains. While we cannot measure the voltage of any individual item in space, we can measure electric fields, and probes existing on many spacecraft can and do find strong electric fields. Also, in chapter 8, Scott discusses some predictions of plasma cosmology that came true in later observations with more advanced instrumentation, such as clear images of filamentation at nearly all size scales in the universe. Filamentation is evidence of interacting Birkeland currents working in the glow discharge plasma mode.

Chapter 10 lays out convincing evidence of the electric sun model (ESM). For instance, the electric sun model accurately predicts why temperatures of the photosphere and chromosphere near the surface of the sun are quite low (~ 4000 K), but then rapidly rise to $> 2 \times 10^6$ K in the upper atmosphere. The ESM also explains behavior of particles ejected from the sun. Near the sun, hydrogen and oxygen ions approach speeds of 300,000 mph, while near the earth they approach speeds of 2 million mph. The acceleration of the "solar wind" is due to acceleration of ions in an electric field. Some astronomers, however, postulate "magnetic reconnection" as a possible driving force behind the accelerated ions. In chapter 11, further details of the electric star model are given, and in chapter 12 Scott argues that "magnetic reconnection" does not occur. After a review of how magnetic fields work and occur in nature, he concludes the chapter by saying, "Open magnetic field lines and magnetic reconnection cannot and do not occur...that solar astronomers feel free to promote these fictions speaks volumes about the state of astrophysics today" (p. 127).

Chapters 13 and 14 are some of the most convincing chapters in the book. Scott ties together the many models and lessons in past chapters, discussing their effects on our observable solar system, galaxy, and universe. One such interesting mechanism is electric discharge machining (EDM), which plasma scientists assert is the culprit of the massive Valles Marineris on Mars. Scott also elaborates how the electric star model fits and explains the Hertzsprung-Russell (HR) diagram when viewed with its x-axis as "current density/absolute temperature" and its y-axis as "luminosity/absolute magnitude." The ESM model seems to provide astronomers with explanations of rapid, complex brightness changes in stars. One example of this behavior is V838 Monocerotis, which rapidly moved almost half way across the HR diagram, from a luminosity similar to our sun to an extremely bright luminosity, within a month. Chapter 15 covers application of ESM to pulsars and other nonstandard stars, and gives more mechanics of Hannes Alfvén's ESM.

Scott continues to apply the electric cosmology to galaxy formation in chapter 16. The spiral morphology of galaxies, among other geometries, was modeled by combinations of Birkeland currents (plasmauniverse.info). Further evidence of current-induced galaxy formation is the appearance of stellar strings, which are claimed to be the result of galactic z-pinches of Birkeland currents. Finally, chapter 17 provides an in-depth discussion on "Redshifts and the Big Bang." Scott presents image after image of the controversial data of Halton Arp, who has collected many images that contradict the "redshift equals distance" convention derived from Hubble's work. Some images include low-redshift galaxies clearly connected to higher-redshift companion galaxies. Others are quasars associated with low-redshift galaxies. One plate shows a high-redshift quasar in front of the

low redshift galaxy NGC 7319. Arp's images are compelling evidence that the BBC must be reevaluated, and that plasma cosmology should be given more voice as an alternative theory. Finally, Scott concludes with a chapter entitled "Lowering the Drawbridge." Here he expounds upon the problems associated with the peer review system and related funding sources.

Many of the points Scott makes regarding nonacceptance of alternative theories to the status quo will ring true to creationists. As such, we should study the tenets and claims of the plasma universe and test its applicability with CRS beliefs. Is it or could it be in alignment with the Word of God? Is it scientifically verifiable? Recently, the Setterfields presented a formulation of the Creation week in the context of a plasma universe (2007). If this is indeed the case, acceptance of plasma cosmology will require significant paradigm-shattering shifts in the scientific community, conventional astronomy, and even within creationist thinking. If indeed it provides a working scientific explanation for an already mysterious cosmos, it could perhaps motivate, or even electrify, a fresh look at the sky by all of us.

References

- Plasmauniverse.info. <http://plasmauniverse.info>. This website contains many seminal papers and studies, mostly from the Institute for Electrical and Electronics Engineer's astrophysics proceedings. Accessed June 2007.
- Setterfield, Barry and Helen. 2007. Was this how God did it? *Creation Matters* 12(2):1-3.
- Thunderbolts.info. http://www.thunderbolts.info/electricsky_preface.htm. Accessed June 2007.

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The Primordial Seed of Life: Creation, Spontaneous Generation, and Emergence Theory

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Abstract

In this work, I examine the origin of the universe in terms of the complexity and the order exhibited in terrestrial life by analyzing the universe's design based on the "intelligent design" of creation. This paper is based on a repertoire of scientific resources and looks at whether an intelligent extraterrestrial "Creator" exists or the entire universe emanated merely from "spontaneous generation." Drawing on different examples extracted from mathematical, scientific, and philosophical resources, I hope to present a decisive argument about the gap that exists between real creation and the mere dogma of spontaneous generation. The emergence theory is discussed, and a tangible example of the failure of the emergence theory is given. The results suggest that two ostensibly very different aspects—not even acting in spaces having the same dimension—actually are equivalent. These two aspects are human perception and physics.

And the LORD God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and the man became a living being.

Genesis 2:7 NKJV

For every house is built by someone, but He who built all things is God.

Hebrews 3:4 NKJV

Introduction

The laws that govern the universe, its astronomical structure and its environment, have influenced our thoughts and actions in a subtle and unequivocal way. We are part of a cosmic environment that is vast in size. The pivoting and hard questions that come to mind are those related to the source of things: Who created the cornucopia of constellations, the complexity seen in living creatures, and the plethora of diverse species? And most of all, who created us? These questions, in their expediency and complexity, cry for an answer.

The main impetus behind this present eclectic work is to give these questions reasonable answers that are based on the repertoire of scientific resources. My paradigm will be the question of

whether an intelligent, extraterrestrial "Creator" exists or whether all we have here in the universe arose merely by "spontaneous generation." Drawing on sundry examples derived from mathematical, scientific, and philosophical sources, I would like to give a decisive argument demonstrating the gap that exists between creation and spontaneous generation. In doing this, I will follow a trail ranging from the macroscopic landscape of the universe, involving structures such as galaxies and clusters of galaxies, down to the microscopic world of the tiniest living information-processing chips on a molecular level—RNA and DNA. Then, I will show that there is a hidden linkage and a delicate enterprise between the universe itself and the minutiae.

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The Physical Dictum

Complexity

We all ponder the question of our own origin. Early Greeks long debated this irksome issue, *viz.*, the cause of life on earth. Creationists view the origin of life as the direct product of intelligent design by a Creator who transcends our space-time domain. This Creator pierced the veil of our three-and-a-half-dimensional universe and then applied information and biochemical “know-how” onto matter. He directly created infinitely complex “machines” such as the heart, the liver, and the central nervous system. Materialists, on the other hand, assert that life with all this complexity was caused by the interplay of natural laws and time acting on nonliving matter—the fortuitous results of accidental circumstances (spontaneous generation). Complex organs like the heart are viewed as either the result of careful design and forethought or the product of blind and haphazard interactions. When all the frills are stripped away, the fundamental question in the debate on the primordial seed of life is: Creation or spontaneous generation?

The vast universe around us is filled with a plethora of matter arranged as planets, stars, and inanimate lumps of celestial matter such as galaxies and clusters of galaxies. Even though the universe is huge, most of its volume is actually void. The mass of our universe obeys quantum laws, which dictate that mass is constant; hence, its great volume is a consequence of its expansion. The core of this is the fact that mass and size are important to our existence in very peculiar ways, which at first glance are not appreciated until we dig deeper into the universe’s order and design. One might expect that our marvelous cosmic inventory would be scattered all over in a chaotic and disorderly fashion, depicting that nature explores all possibilities in a trial-and-error mode, but this is wishful thinking. By looking deeper into things,

one cannot escape noticing that there is a hidden order manifesting itself in creation.

Before we proceed to examine the massive structure of our universe, let us first look at something closer to home: our planet Earth. To see design in action, let us compare our moon and Earth. The moon is arid and dead, while Earth is a life-supporting planet with intricate and colossal complexity that can support biochemistry. But why is this? The reason is that Earth has a biosphere composed of essential life-supporting compounds like oxygen, nitrogen, carbon dioxide, and water. However, the picture goes beyond this to include a hidden force that makes life possible on Earth, namely, gravity. If we were to transport our atmosphere to the moon, all the gases would escape its surface since its gravity is not strong enough to pull these gases inward. There is a delicate balance that manifests itself in the fact that if the gravitational pull of a planet is too great, then the inter- and intra-atomic molecular and chemical bonds that hold our structure will be crushed instantaneously as a result of the enormous gravitational pull. The epitome of this is the fact that life-supporting planets should fall within a critical size range. Such immense complexity cannot just be the product of randomness but rather the product of a stupendous and meticulous design.

The Grand-scale Structure of the Universe

In considering the universe, one of the greatest enigmas facing cosmologists is the evolution and structure formation in the universe. No one can deny the impressive appearance of spirals in the arms of many galaxies such as ours, the Milky Way. Galaxies are considered the sites of star formation, death, and evolution and are regarded as the fundamental structural building units of the universe. Since the beginning of modern cosmology, scientists have been involved in unraveling the mechanisms that un-

derlie structure formation of galaxies and their prominent features and inherent properties. While many models with varying complexity have been developed to account for the origin of galaxies from their primeval seeds, there is no ample empirical evidence that supports any of the *ab initio* scenarios upon which these models have been based. Thus our understanding of galaxy formation remains elusive and rudimentary. In general, however, we know that the balances of two forces are responsible for such structures. For example, stars maintain their integrity by a balance between two opposing forces, the inward gravitational pull and the outward pressure of hydrogen gas sustained by nuclear reactions in the vicinity of their cores. Galaxies, on the other hand, display the inward gravitational pull, resulting from pulling the stars inward, and the rotation of the stars as they orbit around the center of the galaxies or the cluster of galaxies. One can see, therefore, that there is a delicate balance between such forces and a meticulous design that governs them.

All things are made of closely packed arrays of atoms, including galaxies, stars, planets, trees, human beings, insects, cells, DNA, and atoms. Hence, a single atom should have the same density as the collection of these atoms of which they are made. If two things have similar densities, then their mass (M) to volume (V) ratio must be similar (Barrow, 1995). It is also known that volume is proportional to the cube of an average linear length (r^3), regardless of the shape; hence,

$$M = k r^3 \quad (1)$$

where k is an arbitrary constant.

Taking the logarithm ($\log$) of both sides of Equation 1,

$$\log M = \log k + 3 \log r \quad (2)$$

Equation 2 tells us that if one would measure the relative distribution of mass and size starting from the tiniest single

atom to massive galaxies, and plot M versus r on a log-log coordinate system, one should get a linear relationship with a slope of 3. Indeed, this is the case, and such a relation is depicted in Figure 1.

By examining Figure 1, it can be seen that all these solid objects lie along a straight line (dashed line). Applying the method of least squares on the data of Figure 1, the slope obtained is $2.91 \sim 3$, and the correlation coefficient is found to be 0.93. This mathematical representation holds true from the ostensibly very different, tiniest atom (hydrogen atom) all the way to the largest solid structures of the universe, galaxies. The lesson to be learned here is that there is an orderly, hidden connection that governs our universe and extends from the smallest to the largest structures of the universe. Thus, the vicissitudes of a century of physical revelations warn us not to be dogmatic, suggesting implicitly that levels of structure are actually divisible portions of the greater picture, where everything is infinitely interconnected.

The Philosophical Dictum

Aristotle argued in the fourth century B.C. that the articulate design we encounter in living systems is evidence for a divine interlocutor. He asserted in his book *Metaphysics Part II* that causes are finite in a series of events and there must be a first cause in which the chain of explanations automatically leads to a regression, since an infinite regression is senseless (Feinberg and Shafer-Landau, 2005). This notion of first cause can be regarded as a kind of meta-cause with the preponderance to create new chains of events without requiring a predecessor. Following Aristotle's footsteps, Thomas Aquinas in the thirteenth century also corroborated this view, which he referred to as "the teleological argument," one of his four arguments for the existence of God. The assertion in modern times for the existence of God or a designer was presented by an Anglican priest and philosopher by the name of William Paley in his watchmaker argument (Paley, 1802). Paley uses the analogy that exists

between machines and the structures found in living systems. He argued that if we were to find a watch in an empty field, one would logically conclude that it was designed and not the product of random formation. Likewise, since life on Earth has every appearance of contrivance or machinelike design, there must have been a designer for such life.

Scottish philosopher David Hume, who lived between 1711 and 1776, attacked this long-held argument. According to Hume (1981), the weakness of the watchmaker analogy argument is the question of whether or not the similarities apply, and, if so, to what extent. He argued that the complex, machinelike structures found in living plants and animals only have the appearance of design; they were only superficially like machines but natural in essence. These "non-machines," he argued, were "natural" and therefore needed no designer or creator. In addition, he concluded that the fallacy of this argument stems

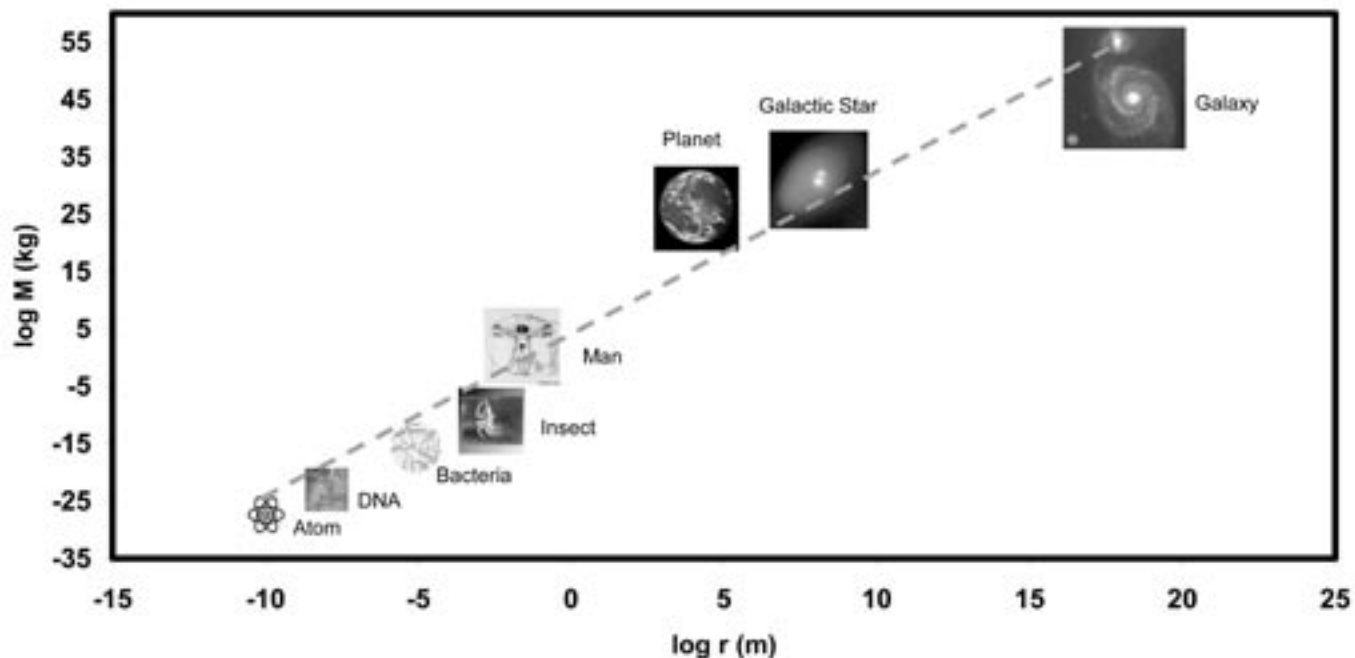


Figure 1. Logarithmic scale of variations of some of the structures found in our universe in terms of mass (M) and size (r). See Equation 2 in text. Despite the vast differences of mass and size between these structures, this figure demonstrates the linear correlation that exists between mass and size in the universe, implying coherence and order.

from the fact that large artifacts such as buildings are built by a group and not by an individual or a creator. He further argued that if a designer is required, then also the designer must require a higher designer and the analogy reasoning leads on *ad infinitum*. He argued that the teleological argument for God presented by Paley would hold true if, and only if, organisms were deeply analogous at the molecular level to machines (Hume, 1981).

The dearth of information about the molecular structure of living systems at the times of Hume and Paley made this an impenetrable thicket since there was no means to verify Paley's claim that living systems were, in fact, micro and/or macro machines. Accordingly, for nearly two hundred years, scientific materialists have maintained that Paley's argument is erroneous and invalid and that the God hypothesis is mundane and moot.

The Biological Dictum

In the last half of the twentieth century, profound and astonishing discoveries regarding the molecular structure and function of living systems have brought the materialistic "spontaneous generation" origin-of-life scheme into serious doubt. In the field of molecular biology, discovery after discovery has revealed that living systems contain structures that conform in every way to the modern definition of a machine. In fact, the parallel between living systems and machines has now been shown to extend all the way to the molecular level. According to Nobel Laureate Jacques Monod, machines are purposeful (teleonomic) aggregates of matter that use energy to perform work (Monod, 1971). The core of experimental science and engineering knowledge confirms that all machines are the result of purposeful design by an intelligent source. The theory of evolution asserts that inanimate matter, which possesses no concepts, know-

how, or purposefulness, developed into machines by chance! No other field in science purports that machines can arise by chance.

Hume's views of creation are also shared by Richard Dawkins (1985), who relied on probability as the criterion for the definition of complex biological entity. The major difference between Dawkins's and Paley's explanations is that Paley attributes the emergence of complex structures to a creator while Dawkins based it on trivialities and accidental events working within forces presumed to be inherent in all matter.

The primary focus on the question of the origin of life emanates from how such incredibly complex molecules can accomplish reproduction, repair, and metabolism of living things. Any feasible theory on the "spontaneous generation" origin of life should explain the origin of this chemical hardware. Similar to computers, living systems require much more than just hardware to perform functions; they also require software or coded information to direct the activities of the cellular hardware. Again, like a computer, this software needs to reside within each living system. Unlike a computer, living systems also possess the marvelous ability to reproduce and pass to the next generation both the hardware and the software or the genetic coding.

No one could fully know the nature of this coding information until 1953, when James Watson and Francis Crick unraveled the DNA structure (Watson and Crick, 1953). They revolutionized our understanding of cellular growth and metabolism. Now we know that the growth and metabolism of all life on Earth is carefully controlled by a language convention called the *genetic code*, carried by the DNA molecule, which governs the actions of the cellular hardware. The prominent questions here are, where did this code and the rules by which it is governed come from? In the last 25 years, the field of information theory has shed a great deal of light on

the nature of codes and programs. Like computers, "spontaneous generation" cannot devise such hardware and/or software embedded with the necessary instructions and information needed to perform the different tasks. This fact poses a serious threat to the materialistic scenario of the origin of life. To overcome this problem and find a solution, one has to rely on a divine intervention, a "Creator." Regarding the origin of life, Francis Crick, winner of the Nobel Prize in biology, stated in 1981 (Crick, 1981):

An honest man, armed with all the knowledge available to us now, could only state that, in some sense, the origin of life appears at the moment to be almost a miracle (p. 88).

In 1970, world-renowned British astronomer Sir Frederick Hoyle decided to calculate the mathematical odds of spontaneous generation from a primordial environmental soup to explain the origin of life (Hoyle, 1981). Applying the laws of mathematics, chemistry, and thermodynamics, he calculated the probability of the spontaneous generation of just the proteins of a single amoeba and found it to be 1 in $10^{40,000}$. Hoyle was a strong believer in the spontaneous generation dogma, but this number reversed his opinion. Hoyle (1981) stated (Missler, 1996):

The likelihood of the formation of life from inanimate matter is one to the 40 thousand naughts (zeros) after it. It is enough to bury Darwin and the whole theory of evolution. There was no primeval soup, neither on this planet nor on any other, and if the beginnings of life were not random they must therefore have been the product of purposeful intelligence (p. 60).

The caveat behind Hoyle's work is the fact that he did not include in his calculations the chance formation of the DNA, RNA, or the cell membrane that encapsulates and holds the cell together. In essence, he did not include

the necessary parts that make this micro-machine run.

A physicist from Yale University, Professor Harold Morowitz, came to the rescue by envisioning a more realistic estimate for spontaneous generation of a bacterium, which included the missing information in Hoyle's calculations (Hynek and Vallee, 1975). He concluded that the odds of a mere single bacterium reassembling by chance are one in $10^{100,000,000,000}$. Other prominent scientists, including Carl Sagan, have statistically calculated the evolution of man by chance, and the results have been staggering: one chance in $10^{2,000,000,000}$ (Sagan et al., 1973). In Mathematics, a probability of less than one in 10^{15} is equivalent to total impossibility and is regarded as "a virtual impossibility" (Eastman and Missler, 1996).

The Emergence Theory Dictum

Recently, there has been renewed interest among scientists in the discussion of the behavior of complex systems and the reconcilability of mental causation, or consciousness with physicalism in terms of emergence theory (Laughlin and Pines, 2000; Laughlin et al., 2000; Bar-Yam, 2004). Emergence theory is based on the dictum that the whole is greater than the sum of the parts; that is, when complex systems supervene upon their lower-level parts, there is a birth of and an inexorable rise to universal complexity. In general, the theory of emergence depends on two main notions: (1) the epistemological, which is concerned with the role of the observer during the act of the observation in terms of limits on human knowledge of complex systems, where emergent properties could not be predicted; and (2) the ontological, which is concerned with the metaphysical assumptions of the observer prior to the act of the observation, where the physical world is layered as composite structures, a ladder, based on increasing complexity in which each step or strata is a conse-

quence of the lower one, resulting in novel qualities.

Many philosophers have adopted the epistemological approach in describing complex systems. The first serious attempt was by George Henry Lewes, who made a clear distinction between resultants in which the sequence of steps that produces a certain phenomenon is traceable, while in emergence it is not (Lewes, 1875). This paradigm might be interpreted as identifying emergence with the epistemological limitations of the observer. Others have followed Lewes's approach (Smuts, 1926; Nagel, 1961; Fodor, 1974; Popper and Eccles, 1977; Teller, 1986; Bedau, 1997; Clark, 1996, 2001; Batterman, 2001).

The early exponent of ontological emergentism was John Stuart Mill, who argued that the mechanical and chemical modes are different in that the total effect of several causes acting in concerted fashion is identical to the sum of each of the causes acting alone in the mechanical, but not in the chemical (Mill, 1843). He coined the term "composition of causes" to describe the mechanical mode. For him, the law of vector addition of forces, such as the parallelogram law, is the "composition of causes," or the mechanical mode. Chemical reactions on the other hand are in violation of the "composition of causes" since the addition of an acid and a base to produce a salt and water is not the sum of effects of the causes had they been acting separately. Many others have adopted the notion of "composition of causes" (Morgan, 1923; Broad, 1925; McLaughlin, 1977). Other emergentists have adopted different definitions for emergent theory, such as Samuel Alexander, who combined both definitions of emergentism (Alexander, 1920). Timothy O'Connor on the other hand adopted a non-supervening, dynamical approach to emergence theory (O'Connor 2000a, 2000b). Paul Humphreys favored a metaphysical relation

he coined "fusion," in which emergent properties result from a fusion of their constituent properties that are nomologically necessary for the appearance of the emergent property (Humphreys, 1997).

Proponents of the nonmaterialist or nonreductionist theories of emergence are rejected *a priori* on the basis that emergence is considered a part of spiritual creation that is governed by a Designer. Stephen Pepper (1926) rejects the idea of emergence based on the argument that such emergent properties are epiphenomenal and that the alleged emergent change is predictable and not cumulative. Jaegwon Kim (1999) argues that both upward and same-level causations necessitate downward causation, and therefore it is epiphenomenal. On the other hand, Ali-Sayed and Zimmer (2005) have argued against the theory of emergence by employing a relativistic interpretation through the inclusion of both the role of the observer during the act of the observation and the metaphysical state of the observer prior to the act of observation.

Accordingly, there is as yet no sound scientific theory of emergence. It can therefore be considered one of the paradoxes of modern science that in spite of our knowledge about the cosmos and its laws, there is no clear general definition of emergence. There are also numerous speculations, edifices, and arguments associated with its validity, axioms, and applicability. It is of special interest to note that not all complex systems can be attributed to emergence. Since emergent properties are not entirely free to make things up as they proceed, they are therefore subjected to constraints, such as the conservational laws, which dictate that matter cannot be destroyed; they can proceed by creating new patterns of relationship by employing preexisting conditions. Within this context, genetic coding, for example, is not entirely confined to this definition since genetic coding can be considered as the lower-

level laws, where other phenomena can be attributed. In retrospect, laws cannot emerge; what emerge are not laws but what the laws describe. What is of significance is the fact that in emergence, one is not discussing the possibility of chance but a thorough regularity in nature, which can be considered a part of the design and order that is described by this work.

A Robust Example of the Failure of Emergence

I have recently shown that the perception of Moiré patterns (when a random-dots pattern is superimposed on itself and rotated by a small angle, creating a circular pattern, see Figure 2) is dependent on the total energy of the system being minimum and can be described by employing classical Newtonian mechanics (Batarseh, 2005, 2007). Calculations of the total energy of the system have revealed that the minimum energy levels correspond to the angle at which humans can perceive the Moiré patterns (Batarseh, 2005). The minimum energy requirement was

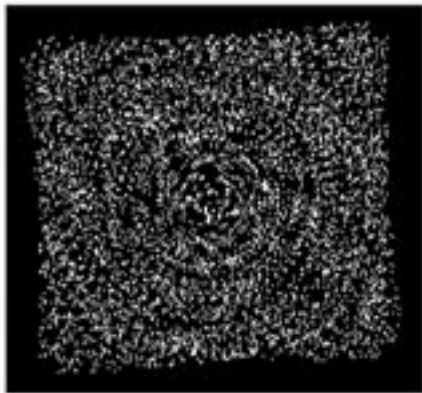


Figure 2. Circular Moiré pattern generated by a computer algorithm through superimposition of two identical copies of 4000 dots distributed homogeneously with one copy rotated by $\theta = 6^\circ$. This angle of rotation corresponds to the total energy of the system being minimum where the Moiré effect is perceived by humans.

found to directly correlate with the impoverishment of the Moiré effect. The outcome of this modeling effort is that it appears that the brain detects parallelism at low energy levels. Therefore, for the perception of these patterns, it can be concluded that filters that respond only to low-energy-level signals govern information processing in the human brain. Hence, the human visual system is making direct relations between the master pattern and its copy, which are strong functions of the total mechanical energy, and once this minimum energy *threshold* is reached, there is no new information that can be deduced, independent of the stimulus code. For a detailed discussion, the reader is referred to Batarseh (2005, 2007).

In retrospect, the neurobiological emergence phenomenon underlying the perception of the Moiré effect is actually reducible to lower physical laws (Newtonian mechanics), which is a clear and obvious violation of the emergence theory, since it explicitly dictates that such complicated neurobiological processes are in fact effectual and can be reduced to basic physical laws. This is in clear agreement with the proposition suggested by Stephen Pepper (1926): “That is to say, if the laws of behavior enter into the physical system at any point they must constitute either primitive laws in that system or be deducible from the primitive laws. There is no other way out of it.”

Interestingly enough, the phenomenon of Moiré patterns actually can be used to infer information about the grand-scale structure of the universe. In fact, the Moiré demonstration can give a plausible cosmological theory for structure formation in the universe regarding the rotation velocity curves of spiral galaxies, as well as observational evidence related to the structures of ionized hydrogen and positions of giant molecular clouds and dust lanes observed in spiral galaxies (Batarseh, submitted). Since detailed derivations of the theory

are available elsewhere (Batarseh, submitted), only a brief discussion will be given here.

Optical measurements of spiral galaxies’ rotation velocity curves as a function of radial distances from the center have shown that the shape of the rotational velocity curve does not follow Keplerian falloff, where the circular velocity should drop as the radius is increased. Specifically, it was observed that the rotation velocities of stars and gas/dust in the center increases with radius while those at the outer skirts of the arms showed higher and nearly flat rotation velocity profiles, extending out to the radial limit of the data (Rubin et al., 1985). This unusual and counter-intuitive behavior of spiral galaxies is extremely common, and most known spiral galaxies behave in this fashion.

In an attempt to reconcile this perplexing phenomenological discrepancy, physicists have invoked invisible dark matter (DM) halos in the peripheries of spiral galaxies so as to force the flattening of the circular velocity profiles, thereby suggesting that galaxies are composed of $\sim 90\%$ invisible dark matter (the standard cosmological principle). This peculiar assumption has resulted in complicated cold dark matter models (Λ -CDM) with many adjustable parameters (Ostriker and Steinhardt, 1995). Despite the continuous efforts to find dark matter, to date none has been found.

An alternative theory to the DM hypothesis is the “modified Newtonian dynamics” model, or MOND, developed and advocated by Milgrom (1983). Milgrom’s approach relies on adding terms to the gravitational potential of the Newtonian dynamical equation to account for the astronomical mass discrepancy and forcefully making it fit the observed rotation velocity data (Milgrom, 1983). Notwithstanding its empirical success, MOND remains an *ad hoc* modification of Newtonian dynamics because it was designed to fit rotational

velocity curves without a foundation in deeper theory (Sanders, 2003).

To counteract these deficiencies in the previous theories, I have recently developed a theory referred to as Virialized Astrophysical Moiré Patterns, or VAMP, based solely on Newtonian dynamics. It was found that VAMP's predictions are consistent with observational evidence, lending support to its foundations. In particular, VAMP correctly accounts for the rotation velocity profiles as a function of radial distance, the total mass of spiral galaxies, and many other features associated with spiral galaxies without taking the so-called DM or MOND into account. For a thorough review of VAMP and its predictions, the reader is referred to the literature (Batarseh, submitted).

Collectively, the above unequivocally ascertain the fact that there is seemingly a collapse of higher-level entities to lower-level entities that are predictable and can be described by elementary physical laws, clearly violating the underlying premise of emergence. Thus, it appears that in a universe of colossal complexity, everything at first glance seems to be discrete; but a closer look reveals that things are essentially infinitely interconnected and eventually can be described by basic primitive laws that were implemented and standardized by a Designer or a Creator.

Summary

The monotheistic religions, Judaism, Christianity, and Islam, have asserted for thousands of years the doctrine that there is a transcendent Deity, a Creator who produced our space-time domain, pierced this veil, and inserted information and know-how onto matter to form life out of nothing. The result was the birth of an ordered, energized universe filled with information and every appearance of contrivance and design.

The above leads us to conclude that the absence of a supernatural cause,

or Creator, for the origin of life is ridiculous. So we invoke a transcendent Creator who fashioned, ordered, and established the laws that govern life. To invoke the god called "spontaneous generation," however, is to believe in "virtual impossibilities."

References

- Alexander, S. 1920. *Space, Time, and Deity*. Macmillan, London, England.
- Ali-Sayed, M., and R.M. Zimmer. 2005. The question concerning emergence. <http://mcs.open.ac.uk/sma78/belgium.pdf>.
- Barrow, J.D. 1995. *The Artful Universe*. Oxford University Press, London, England.
- Bar-Yam, Y. 2004. A mathematical theory of strong emergence using multiscale variety. *Complexity* 9:15–24.
- Batarseh, K.I. 2005. Energy levels of Moiré patterns: Relation to human perception. *Biological Cybernetics* 93:248–255.
- Batarseh, K.I. 2007. The dynamical, psychophysical and neurobiological aspects encompassing the human perception of Moiré patterns: Visual consciousness subtle link to the primitive laws of the universe. In Williams, T.O. (editor), *Biological Cybernetics Research Trends*. Nova Science Publishers, Hauppauge, NY.
- Batarseh, K.I. submitted. On the virialized modeling of the rotation curves and mass of spiral galaxies from the perspective of Moiré patterns: A purely baryonic theory.
- Batterman, R. 2001. *The Devil in the Details: Asymptotic Reasoning in Explanation, Reduction, and Emergence*. Oxford University Press, Oxford, UK.
- Bedau, M. 1997. Weak emergence. In Toberline, J.E. (editor), *Mind, Causation, and World..* Blackwell, London, UK.
- Broad, C.D. 1925. *The Mind and Its Place in Nature*. Routledge & Kegan Paul, London, England.
- Clark, A. 1996. *Being There*. MIT Press, Cambridge, MA.
- Clark, A. 2001. *Mindware*. MIT Press, Cambridge, MA.
- Crick, F. 1981. *Life Itself, Its Origin and Nature*. Simon & Schuster, New York, NY.
- Dawkins, R. 1985. *The Blind Watchmaker*. Longmans, London, UK.
- Eastman, M., and C. Missler. 1996. *The Creator Beyond Time and Space*. TWFT, Costa Mesa, CA.
- Feinberg, J., and R. Shafer-Landau. 2005. *Reason and Responsibility: Readings in Some Basic Problems of Philosophy*, 12th Edition. Thomson Learning, Stamford, CT.
- Fodor, J. 1974. Special sciences. *Synthese* 28:97–115.
- Hoyle, F. 1981. *The Universe: Past and Present Reflections*. University College, Cardiff, UK.
- Hume, D. 1981. *Dialogues Over Natural Religion*. Reclam, Stuttgart, Germany.
- Humphreys, P. 1997. Emergence, not supervenience. *Philosophy of Science* 64: S337–S345.
- Hynek, A., and J. Vallee. 1975. *The Edge of Reality*. Henry Regency, Chicago, IL.
- Kim, J. 1999. Making sense of emergence. *Philosophical Studies* 95:3–36.
- Laughlin, R.B., and D. Pines. 2000. The theory of everything. *Proceedings of the National Academy of Sciences* 97:28–31.
- Laughlin, R.B., D. Pines, J. Schmalian, B.P. Stojkovic, and P. Wolynes. 2000. The middle way. *Proceedings of the National Academy of Sciences* 97:32–37.
- Lewes, G.H. 1875. *Problems of Life and Mind*. Trench, Turbner & Co., London, England.
- McLaughlin, B. 1977. Emergence and supervenience. *Intellectica* 2:25–43.
- Milgrom, M., 1983. A modification of the Newtonian dynamics as a possible alternative to the hidden mass hypothesis. *Astrophysical Journal* 270:365–370.
- Mill, J.S. 1843. *System of Logic*. Longmans, Green, Reader, & Dyer, London, England.
- Missler, C. 1996. *The Creator Beyond Time and Space*. The World for Today, Costa Mesa, CA.
- Monod, J. 1971. *Chance and Necessity: An*

- Essay on the Natural Philosophy of Modern Biology*. Knopf, New York, NY.
- Morgan, C.L. 1923. *Emergent Evolution*. Williams & Norgate, London, England.
- Nagel, E. 1961. *The Structure of Science*. Harcourt, Brace and World, New York, NY.
- O'Connor, T. 2000a. *Persons and Causes*. Oxford University Press, Oxford, UK.
- O'Connor, T. 2000b. Causality, mind and free will. *Philosophical Perspectives* 14: 105–117.
- Ostriker, J.P., and P.J. Steinhardt. 1995. The observational case for a low density universe with a non-zero cosmological constant. *Nature* 377:600–602.
- Paley, W. 1802. *Natural Theology*. Parker, Philadelphia, PA.
- Pepper, S. 1926. Emergence. *Journal of Philosophy* 23:241–245.
- Popper, K.R., and J.C. Eccles. 1977. *The Self and Its Brain*. Springer International, New York, NY.
- Rubin, V.C., D. Burstein, W.K. Ford Jr., and N. Thonnard. 1985. Rotation velocities of 16 SA galaxies and a comparison of Sa, Sb, and SC rotation properties. *Astrophysical Journal* 289:81–98.
- Sagan, C., F. Crick, and L.M. Muchin. 1973. *Communication with Extraterrestrial Intelligence (CETI)*. MIT Press, Cambridge, MA.
- Sanders, R.H., 2003. Clusters of galaxies with modified Newtonian dynamics. *Monthly Notices of the Royal Astronomical Society* 342:901–908.
- Smuts, J.C. 1926. *Holism and Evolution*. Macmillan, New York, NY.
- Teller, P. 1986. Relational holism and quantum mechanics. *British Journal for the Philosophy of Science* 37:71–81.
- Watson, J., and F. Crick. 1953. Molecular structure of nucleic acids. *Nature* 171:737–738.



Book Review

Darwin's Conservatives: The Misguided Quest

by John G. West

Discovery Institute Press, Seattle, 2006, 157 pages, \$15.00.

Some scholars who are otherwise conservative (traditional family, morality, etc.) support Darwinism. These individuals are Darwin's conservative champions, and Larry Arnhart at Northern Illinois University is one of these articulate advocates. His argument is that Darwinism supports traditional morality, family life, sexuality, economic liberty, and non-utopian limited government and is compatible with free will, personal responsibility, and religion. Also, he believes that "Darwinism has not been refuted by intelligent design" (pp. 10-11).

The author of *Darwin's Conservatives*, John West, strongly disagrees with the above contentions. West declares that "among the elites," Charles Darwin

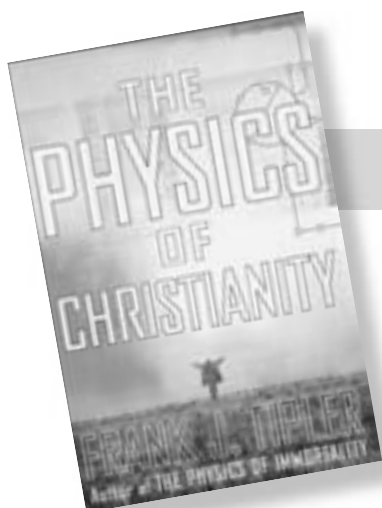
"retains his prestige" to the extent that he is recognized "as a secular saint" (p. 93). In seven chapters and a conclusion, West mounts a convincing refutation of Arnhart's views, while showing that Darwinian biology is seriously flawed and even corrosive. Intelligent design clearly is supported by data. West, who is strongly opposed to belief in the idea of theistic evolution, says, "Such religious believers either reject full-blown 'Darwinian' (i.e., unguided) evolution or they jettison traditional theism in order to uphold a consistent Darwinism" (p. 66).

It is of considerable interest that the Discovery Institute, of which West is a Senior Fellow, "does not advocate forc-

ing intelligent design into classrooms. Instead, the group favors the more limited policy of encouraging mainstream scientific criticisms of neo-Darwinism to be presented alongside the best evidences favoring Darwin's theory" (p. 74).

Darwin's Conservatives ends with an appendix containing information about the Cobb County, Georgia case, which started in 2002. There are also an impressive 303 notes with references and comments, along with a seven-page index. I consider West's book worthy of wide distribution and serious attention.

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Book Review

The Physics of Christianity

by Frank J. Tipler

Doubleday, New York, 2007, 320 pages, \$27.50.

Author Tipler is a professor of mathematical physics at Tulane University, New Orleans. This book is a summary of Tipler's scientific exploration of the central New Testament claims of the Christian faith. He strives to give credible scientific explanations for the Lord's virgin birth, resurrection, and incarnation. Tipler believes that miracles violate probability but not the physical laws established by God. It appears contradictory to this reviewer to explain supernatural events with natural science as we know it today. At the same time, however, Tipler accepts the fundamentals of Christianity. He laments that his salary is 40 percent less than the Tulane average for professors because of his public testimony (p. 268). Perhaps some *Quarterly* readers can relate to this injustice.

Tipler sees physics as the key to understanding biblical truth. He interprets the Star of Bethlehem as a supernova, although no such event was recorded by contemporary astronomers (p. 140). The Shroud of Turin is said to support the Virgin Birth of the Lord, based on the DNA of bloodstains (p. 154). Readers will realize that Tipler here is multiplying layers of speculation. In an attempt to explain the Lord's rising from the dead, Tipler suggests a bodily dematerialization and reconstruction via quantum mechanical transformation. The process is further described as electroweak tunneling that temporarily

converted the Lord's body into pure energy. Tipler further suggests that at the Easter resurrection, the Lord's flesh may have emitted a high, temporary flux of neutrinos. Tipler calls for an analysis of the crystalline rock around Jesus' tomb, seeking evidence for the resulting high energy particle tracks. This is easier said than done since we do not know the actual location of the Lord's tomb. Tipler must be given credit for such original ideas, however strange they may appear.

Biblical creation is not treated in this book, nor is the word "creation" listed in the index. Tipler fully accepts evolutionary time (p. 267), the big bang, and theistic evolution. Unlike Einstein and many scientists, however, Tipler insists that God is a person "because He can talk to us" (p. 75). As an aside, the author also supports the right-to-life movement, stating that a fetus is a person from the instant of conception (p. 261).

Many questionable ideas appear throughout the book. Tipler states that a mathematical, cosmological singularity has multiple parts, or hypostases. This fact then is used to explain the Trinity, and also the existence of good and evil in the world (p. 96). Also assumed in Tipler's thinking are an infinite number of universes. There is even a parallel universe where evil does not exist, but unfortunately we are not located there. Some related ideas are not explained

clearly, which may lead to Tipler's next book.

Surprising predictions appear in *The Physics of Christianity*. Tipler describes a new, potential energy source that makes atomic weapons look like "spitballs" (p. 4). This energy source is the conversion of entire macroscopic objects into raw energy. Tipler predicts this conversion will become possible and "easy" within 50 years. In fact, Tipler sees Christ's resurrection as an object lesson, hinting at the reality of this 100 percent matter-energy conversion. Because this unlimited energy source could readily result in the destruction of the earth by evil people, Tipler further predicts that Christ will intervene and conclude the present world system within the lifetimes of some readers.

Tipler places physics on a high pedestal, writing that "physics is the only source of answers to any question, in particular, the only source of answers to fundamental questions" (p. 281). In fact, the author sees Christianity itself as "a branch of physics" (p. 271). Right or wrong, this book stretches the reader's mind in several directions, some of them quite uncomfortable. A book appendix reviews the Apostles', Athanasian, and Nicene Creeds. Helpful notes, references, and index also are included.

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Origins of Apoptosis: Selfish Genes or Intelligent Design?

Jerry Bergman*

Abstract

Apoptosis is a complex biochemical mechanism whereby a specific cell destroys itself under certain conditions, without injury to the cells around it. A literature review reveals that neo-Darwinists have been unable to explain how the mechanism for apoptosis could have evolved in a step-by-step process. The mechanism of apoptosis regulates cell life for the advantage of the organism as a whole and not for the mere advantage to the genes, as Dawkins proposed. Apoptosis supports the concepts of irreducible complexity and intelligent design.

Introduction

Cells can be eliminated by two means: necrosis (the death of a cell caused by injury or disease) and apoptosis (programmed cell death). Apoptosis is a critically important mechanism used by all multicellular organisms to eliminate unneeded or harmful cells including cancerous and precancerous cells (Shi, 2002; Steller, 1995; Huang and Strasser, 2000 p. 839; Weinrauch and Zychlinsky, 1999). Apoptosis also plays a critical role in normal development, in physiological balance (homeostasis) and in cell turnover (Elmore, 2007; Ashkenazi and Dixit, 1998).

From the embryo stage forward, cell division and apoptosis must be finely balanced and synchronized to maintain health and life. For example, after a sunburn, apoptosis destroys damaged cells

that could become cancerous, allowing them to be replaced. Apoptosis results in cellular shrinkage, mitochondrial breakdown, release of cytochrome C, development of blebs on the cell surface, and recycling of cell components.

Definitions

Irreducible complexity is “A single system composed of several interacting parts that contribute to the basic function of the system, where the removal of any one of the parts causes the system to effectively cease functioning” (Behe, 1996, p. 9). An example of irreducible complexity is the fact that the chemical element carbon *must* have six protons. If one proton is removed, carbon no longer exists, but rather boron results. *Intelligent design* involves a set of criteria used to evaluate the physical world to determine

if intelligence is responsible for some event. A common example in forensics is that it must be determined if a dead body died as the result of disease, accident, or intelligent action—specifically in legal terms suicide or homicide.

Steps Involved in Apoptosis

Three pathways triggering apoptosis are now known. The first is the *extrinsic* or *death receptor pathway* triggered by a signal from outside of the cell (a death ligand that binds to a death receptor). The second is the *intrinsic pathway* triggered by a signal from within the cell caused by factors including radiation, toxins, and hypoxia. The last is the *perforin pathway* caused by cytotoxic T cells. These three pathways trigger the *execution pathway* or the pathway actually causing the cell's destruction (Elmore, 2007).

A cell undergoing apoptosis always displays a certain set of characteristic traits, including cell shrinkage and pyknosis, the contraction of the cell nucleus into a compact mass that effectively ac-

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cepts stain (Elmore, 2007). The actual Apoptosis begins when proteases known as initiator caspases are activated inside a cell as a result of proteolytic processing that causes other proteases to digest specific cell components (Hengartner, 1998). Proteases called *caspases* function in apoptosis by directing complex specialized molecules to lyse the cell's chromatin, destroy its nucleoskeleton, destroy the enzymes that replicate and repair DNA, and activate CAD. CAD refers to the three enzymes, carbamoyl phosphate synthase, aspartate transcarbamylase, and dihydroorotase, that cut DNA up into small, roughly equal-sized portions of 200 base pairs (Rupinder et al., 2007).

Caspases also activate enzymes that digest the cytoskeleton, destroy the cell's ability to adhere to other cells, and eventually break the cell into small fragments (Barinaga, 1998). They even cause a phospholipid to move from the apoptotic cell membrane's inner surface

to its outer surface to attract phagocytes. The fact that "all known caspases share a similar conformation at the substrate-binding groove" indicates irreducible complexity because a specific complex design is required for the system to function and no complexity gradations in their design are known in the living world (Shi, 2002, p. 460). All known organisms where apoptosis occurs require this caspase system to function properly (Rupinder et al., 2007).

A second group of proteases involved in apoptosis includes the protein-cleavage enzyme called "Interleukin-1 converting enzyme-like proteases," abbreviated ICE-like proteases. The ICE-like proteases help to destroy the cell by digesting essential proteins and certain structural components in the cell's genetic material to prevent the cell from repairing itself (Martin et al., 1995). This double assault on the cell ensures both its death and its safe destruction without adversely affecting other cells.

Another step in apoptosis involves the cell sending attractants such as phosphatidyl serine (called "eat me" signals) from the inner cell membrane leaflet to the outer cell membrane leaflet in order to attract phagocytes. Normal cell to cell interactions, such as the ability to adhere to other cells, are also rapidly lost in cells undergoing apoptosis. The cell then gradually becomes more spherical, and its cell membrane undulates, forming protrusions or bulges called *blebs* (see Figure 1). The cell soon fragments and its membrane remnants encapsulate the cell fragments, which are at this stage known as *apoptotic bodies* (Veggeberg, 1995). This reduces the amount of leakage of the apoptotic cell's toxins or noxious contents (Elmore, 2007).

The cell fragments display antigens that cause them to be ingested by scavenger macrophages that reside in all tissues and by other local scavenger cells. The cell fragments are then broken down by lysosomal organelles and the cell's

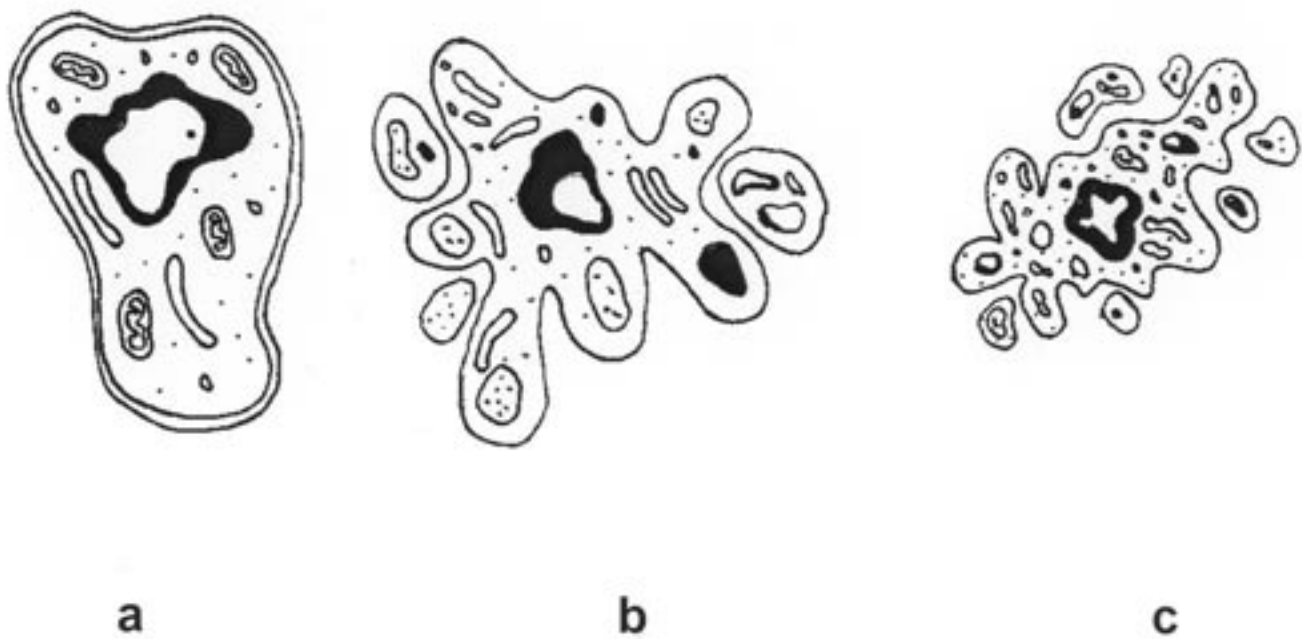


Figure 1. Steps in apoptosis. a. The cell's chromatin, a mixture of chromosomes and proteins, begins to condense. b. Here the cell membrane loses its structural integrity. Protuberances called "blebs" appear on the surface surrounding the cell. c. The cell shrinks and its DNA becomes fragmented. The cell parts are then recycled. Adapted from Medina (1996, p 37).

nutrients are recycled without triggering the inflammatory response typical of necrosis. The entire apoptotic process takes only about an hour, which is one reason why it went undiscovered by biologists until recently (Raff, 1996).

History of Apoptosis Research

The existence of apoptosis has been theorized since the dawn of cell theory but was described only recently. It once was assumed that cell death invariably resulted in negative consequences in the body, but by the 1950s, research had demonstrated that certain cells were systematically eliminated as a *normal* part of development. Examples include the tadpole's tail, the webbing between the fingers in human embryos, and the change in breast tissue after a mother stops breast feeding (Duke et al., 1996). Apoptosis also organizes the brain by eliminating neurons that do not make proper connections to other nerve cells. Apoptosis even causes the loss of large groups of cells, such as the dropping-off of flower petals. This latter role for apoptosis is the source of the term now used to label the entire process (apoptosis is Greek for *falling off*). The term apoptosis was first used only in 1972 (Elmore, 2007).

A breakthrough paper published in 1972 outlined the first evidence for apoptosis in precancerous cells (Kerr, Wyllie, and Currie, 1972). Unfortunately, this paper remained largely unnoticed until the early 1980s. The work of Robert Horvitz on *Caenorhabditis elegans* (an oft-studied nematode) was also critically important in understanding apoptosis (Veggeberg, 1995).

The Significance of Apoptosis

Apoptosis occurs at the expense of an individual cell and its genome, but benefits the entire organism. All eu-

karyotic cells contain all of the genes needed to self-destruct and will do so unless these genes are damaged, as with cancer cells, or unless the cell receives signals from other cells to block apoptosis (Raff, 1996). Maintaining a strict balance between cell division and cell death benefits the organism in numerous ways. Living on the edge of cell suicide ensures that all damaged cells are rapidly destroyed and that their corpses are expediently and effectively engulfed by neighboring cells (Adams and Cory, 1998; Wu, 1996).

Apoptosis is especially important in understanding many complex cellular processes, such as how insulin-like growth factor I and other proteins can control and eliminate select cells. Knowledge of apoptosis is required to understand how *p53* and other critically important tumor suppressor genes function (Mercer et al., 2007). These tumor suppressor genes regulate the repair of damaged DNA, but if the damage is too extensive the genes cause apoptosis to destroy the cell.

Problems Associated with Misregulation of Apoptosis

Aberrant regulation of apoptosis can allow cells with mutations (such as cancerous cells) to continue to divide and consequently such aberrant regulation contributes to cancer progression and other diseases. Misregulation of apoptosis can cause the destruction of cells that are not damaged, as during and after a heart attack. If damaged cells that could be repaired are destroyed, unnecessary heart damage results.

Misregulation of apoptosis can contribute to other disorders, such as tumors and certain autoimmune diseases like rheumatoid arthritis (Rupinder et al., 2007; Barinaga, 1998). Even Alzheimer's as well as Parkinson's and Huntington's diseases are all believed to involve a condition that causes specific neuron to commit suicide prematurely (Fesik,

2000). It is also believed that apoptosis is used to fine-tune the immune system by eliminating T-cells that attack the person's own cells, a step necessary to develop normal autoimmunity.

Necrosis and Apoptosis Compared

Accidental cell destruction, known as *necrosis*, is normally undesirable. But apoptosis, when properly regulated, is beneficial. The word *necrotic* comes from a Greek word meaning *to kill*. Cell death by necrosis occurs when a cell is severely injured by physical or chemical means, such as by oxygen deprivation. In necrosis, cells usually swell and lyse, releasing cytoplasmic material that triggers an inflammatory response in the intercellular matrix (Elmore, 2007). A major contrast between necrosis and apoptosis is that, in necrotic death the cell is a passive victim, but in apoptosis the cell is an active participant, even expending its own energy to achieve its own demise (Zamzami and Kroemer, 2001). Whether a cell dies by necrosis or apoptosis depends partly on factors including the cell death signal specifics, the physiological environment, the tissue, and the stage of the cell development (Elmore, 2007, p. 496).

Mitochondria play a critical and central role in mediating the intrinsic apoptosis pathway (Hengartner, 1998a). In necrotic death, the mitochondria and other cell organelles are often the first to swell and rupture, followed by the lysis of the entire cell. In apoptosis, instead of the cell *swelling*, internal mechanisms such as the action of caspases, cause the cell to *shrink*. As the apoptosized cell shrinks, it pulls away from its neighboring cells. As a result, the apoptotic cell normally does not trigger an inflammatory response. The nucleus also shrinks dramatically in apoptosis, and the chromatin condenses into distinct blobs that then migrate to the nuclear envelope (Duke et al., 1996, p. 80).

Exceptions to the usual elimination of cells by apoptosis involve a few cell types, such as those making up the eye lens. In an adult, the eye lens consists primarily of cell carcasses. The lens forms by cells slowly dying, and during this time most of the cytoplasm is gradually replaced by a crystalline protein (Duke et al., 1996). Other examples include skin cells which, as they mature, replace their contents with keratin protein, acquire a water-resistant coating, die, and are eventually sloughed off to be replaced by the cells moving up from below.

Apoptosis of T-Lymphocytes

The specifics of apoptosis also vary according to the cell type. More is known about apoptosis of T-lymphocytes than most other cell types. T-cells arise from bone marrow precursors, migrate to the thymus as thymocytes, and then develop into specialized T-cells that display receptor molecules that enable mature T-cells to detect specific antigens (McColl et al., 2007; Gregory, 1995). Thymocytes that either fail to produce functional receptors, or produce receptors that respond to self-cells, are also destroyed by apoptosis. Specifically, the thymocytes that are destroyed are those that bind too strongly to the molecules displayed in the thymus, which means that they may target healthy tissue later, causing an autoimmune disease (Golstein et al., 1991). Defective apoptosis may allow some of these auto-reactive cells to survive, resulting in malfunctioning of the immune system (Fesik, 2000). The best examples are the various autoimmune diseases.

Death Receptors

Apoptosis is triggered either by controlled deprivation of certain cell survival factors, or by a mechanism involving a so-called death receptor such as Fas, Apo 1, CD95 and many other protein death receptors. These protein recep-

tors all belong to the tumor necrosis factor (TNF) gene superfamily, which are collectively called death ligands. Some growth receptors, such as the Nerve Growth Factor (NGF) receptor, also contain a death domain to help regulate growth and repair (Ashkenazi and Dixit, 1998). The ligands that bind to these receptors all activate apoptosis and, thus far, all appear to be structurally similar. As is true of many proteins used in apoptosis, they do not manifest a graduation from simple to complex as expected by neo-Darwinism.

Factors Controlling Apoptosis

Cell death can be triggered by external or internal chemical cell messages, growth, survival factors, or even conflicting signals that regulate cell division (Fesik, 2000). Cells that become infected by viruses often trigger apoptosis. Apoptosis can be triggered by a number of other mechanisms, including the *p53* and other tumor-suppressor genes. Cells with DNA damaged by mutagens trigger production of *p53* protein, which then activates a set of steps that may include apoptosis, thereby leading to the destruction of the cell carrying the mutation. These many mechanisms that function to repair (or to destroy) cells with mutations is a major problem for neo-Darwinism. If repair worked perfectly, evolution could not occur. Without repair, life as we know it could not exist (Elmore, 2007).

Specific signals known to trigger apoptosis vary according to the cell type and other factors that result in selective elimination of specific cells (Huang and Strasser, 2000). Apoptosis can even be triggered simply by time. Keratinocytes—a type of skin cell—undergo senescence via apoptosis about 21 days after they begin to migrate outward toward the skin surface.

Cell sensitivity and susceptibility to apoptosis vary according to several factors. A set of protein molecules tightly regulate apoptosis in complex ways;

some facilitate promotion, while others result in inhibition (Korsmeyer, 1995). The protein family called Bcl-2 inhibits apoptosis, while another family of related proteins, including Bad, Bak, Bok, Bik, and Bid proteins, all promote apoptosis (see Figure 2). A balance of promotion and inhibition factors is required to ensure that apoptosis is triggered only when needed and is blocked when not needed (Zamzami and Kroemer, 2001).

Apoptosis Proteins

The many functions of the proteins involved in apoptosis are now being actively investigated, and more are discovered each year. Lewin (1997, p. 1128) noted that the functions of one of the most studied apoptosis regulator families, Bcl-2, are still “mysterious” but most regulate the signals that lead to caspase activation (Huang and Strasser, 2000). The Bcl-2 family of proteins includes both pro- and anti-apoptotic molecules that play a pivotal role in determining if a cell will live or die (Gross et al., 1999). Bcl-2 has a C-terminal anchor that is also found not only on outer nuclear but also on mitochondrial and endoplasmic reticulum membranes—indicating that it likely controls a wide variety of cell functions (Gross et al., 1999).

Cell death can be blocked by the production of high levels of apoptosis-inhibiting Bcl-2 protein (Hartwell and Kastan, 1994; Hartwell and Weinert, 1989). In lymphocytes, the *bcl-2* gene blocks apoptosis, while the *bax* gene promotes it. Normally Bcl-2 and Bax protein are produced in nearly equal amounts in the cell, eventually binding together to form heterodimers, negating their effects (Veggeberg, 1995). Lack of balance between the two can cause major problems: too much Bcl-2 protein may contribute to cancer and too much Bax protein results in premature cell death (Adams and Cory, 1998).

Certain normal cells, which would cause devastating effects if they were lost, such as heart cells, produce relatively

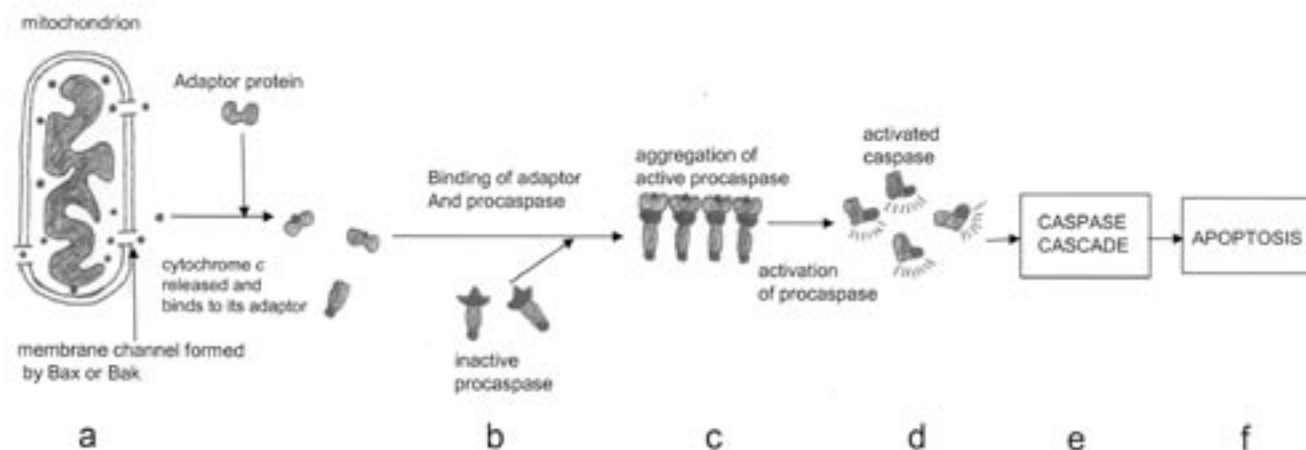


Figure 2. Apoptosis as regulated by the Bcl-2 family of intracellular proteins. (a) The death-promoting Bcl family of proteins, including Bak and Bax, form channels in the outer mitochondrial membrane. (b) The cell releases cytochrome C into the cytosol which then binds to an adaptor protein. (c) The adaptor protein then promotes both the aggregation and the activation of procaspase. (d) Once activated, the caspase enzyme triggers a cascade (e) that leads to, (f) Apoptosis. Adapted from Alberts (2004, p. 628).

high levels of Bcl-2 protein. They are thus less likely to be destroyed by apoptosis and are more likely to be repaired (Mercer et al., 2007). If they become cancerous, these cells may give rise to aggressive tumors. Melanocyte cells produce the pigment melanin that darkens the epidermis, protecting the dermis from ultraviolet radiation damage. If melanocytes perished too easily, the loss of protection function that results causes other cells to be at a much greater risk of sustaining UV damage. But melanocytes manufacture large amounts of Bcl-2, and as a result, they normally undergo apoptosis only in extreme cases. Consequently, when melanocytes become cancerous, the cancer is not destroyed by apoptosis because of this factor, and hence melanoma is often lethal in a short time.

Cells (such as heart muscle cells) that are not prone to UV damage produce very small amounts of apoptosis-inhibiting Bcl-2 protein. Therefore, they tend to undergo apoptotic destruction quite readily. This system normally protects these cells against cancer, but

lack of proper balance can also work against the body's best interest (Mercer et al., 2007).

Apoptosis and Viral Infections

Apoptosis likewise functions during viral infections in several ways. In order to reproduce, the virus must shut down the cell's ability to manufacture all proteins *except* those necessary to produce more viruses. The host's own protein synthesis is thus blocked, which can trigger apoptosis, killing both the cell and the virus (Fesik, 2000). This normally protects the cell from a wide variety of viruses.

To prevent this, the Epstein-Barr virus, which causes mononucleosis, and certain other viruses, possess apoptosis-suppressing genes that code for a pseudo Bcl-2 protein that is structurally similar to the Bcl-2 protein. It can even function as normal Bcl-2 protein, inhibiting apoptosis (Williams and Smith, 1993). In some cases, the Epstein-Barr virus can cause the cell to increase its production of Bcl-2, which blocks apoptosis long enough to allow the virus to reproduce effectively.

Apoptosis and Cancer

Cancer is the loss of normal control over cell division, differentiation, and other cell functions. It is caused by damage to the cell's DNA. For cancer to develop, the apoptosis mechanism must be disrupted or delayed long enough to allow some cells to accumulate enough mutations so that they are able to divide uncontrollably and, eventually metastasize (Fesik, 2000). The result is the production of cells that possess genetic mutations, and therefore function abnormally. These cancer cells have not sustained enough damage to cause them to die. In cancer cells, the genetic damage usually leads to an inability to induce apoptosis because the gene that codes either for the p53 protein, or some other tumor suppressor gene, is mutated or inactivated (Wang et al., 1995). Cancer cells may then become immune to normal apoptosis triggers.

Knowledge of the relationship between apoptosis and cancer can facilitate our exploitation of apoptotic mechanisms to diagnose precancerous conditions. It may also aid in determin-

ing the location of the cancer. The best example is follicular lymphoma, caused by a translocation of a *bcl-2* gene from chromosome 14 to 18 confers immortality on immune system B-cells, which can then accumulate to dangerous levels similar to leukemia.

Damage resulting from oxygen free radicals is a major cause of mutation that can in turn lead to cancer, aging, cataracts, atherosclerosis and other diseases. Oxygen free-radicals can also trigger apoptosis if the damage is not sufficient to destroy the cell by necrosis. A diet high in free radical neutralizers, such as vitamins A, C, E and selenium, can reduce free-radical damage.

Use of Apoptosis to Treat Cancer

Programmed cell death is affected by many of the same genes that control the cell division cycle (Maddika et al., 2007). A functional approach to the study of programmed cell death has involved viruses that are inactivated as pathogens by removing their disease-causing genes. Genes that function to fight disease are then spliced into the virus genome. The virus then is able to splice its new anti-virus genes into the DNA genome of the cells that it infects.

An example of how this approach is used to kill cancer cells involves injecting tumors with modified herpes viruses-containing genes that trigger apoptosis. Virus genes that can be inserted into the cell's genome include the "suicide genes," causing these cells to be highly susceptible to drugs, such as ganciclovir, which is used to treat herpes (Hartwell and Kastan, 1994). This approach infects the cells with a virus that gives them a pseudo-disease. Then drugs that are effective in killing "pseudo-diseased" cells are utilized to kill the infected cells. Treated subjects are also injected with a stimulant that is used to intensify the effect of the "suicide gene." A problem yet to be overcome is that the modified herpes virus still triggers the immune

system, which then attacks the modified virus and interferes with the effect of the suicide gene. It is necessary to develop techniques to determine how virus genes can remain hidden, or how the immune system can be prevented from detecting and destroying these viruses. Viruses can also be used to taxi working genes into a cell to replace or "fix" damaged genes that lead to cancer.

Implications of Apoptosis for Intelligent Design

Only a small amount of the knowledge about the biological world known today was known in the 1800s when William Paley penned his argument from design seen in a pocket watch. What has been learned since then has eloquently supported Paley's thesis that design is strong evidence for a Designer. The level of the complexity in the cell is now known to exceed the level of complexity existing above the cellular level. Apoptosis is only one of many thousands of complex cellular systems that are now being researched. I did a computer search of over 15 million records from two databases and uncovered almost 70,000 articles on apoptosis. But only four of these 70,000 were remotely relevant to the evolution of apoptosis. None of these contained any empirical evidence that would contradict Behe's (1996) or Paley's conclusions (Blackstone and Green, 1999; Wiens et al., 2000; Aravinch et al., 1999).

One of the three articles that mentioned evolution was a highly speculative discussion of the role of mitochondrial cytochrome C in apoptosis (Blackstone and Green, 1999). The authors speculated that apoptosis in more complex animals may be a vestige of evolutionary conflicts between the supposed endosymbiosis of the mitochondrial organelle and its cellular host. But endosymbiosis, the belief that organelles in metazoan cells arose by ancestral cells capturing microbes, is itself an idea that suffers

from several major problems (Bergman, 1998).

In another article, Wiens et al. (2000) evaluated sequence comparisons of certain organic molecules involved in apoptosis, such as the Bcl-2 superfamily. They found a high similarity between certain metazoan organisms and vertebrates. A third author tried to explain how neo-Darwinism can account for two opposite solutions to the problem of virus survival. In some cases, viruses inhibit apoptosis, and in others, viruses can stimulate apoptosis (Krakauer and Payne, 1997). In none of these articles was a substantial case made for the macroevolutionary origin of apoptosis.

The last article located (Kroemer, 1997) was the first major attempt to explain the evolution of apoptosis. Kroemer used endosymbiosis theory in an attempt to explain how apoptosis could have evolved. His discussion effectively illustrates the difficulties in the evolution of apoptosis. He also attempts to speculate on the evolutionary relationship of necrosis to apoptosis but only serves to accentuate the many differences between the two systems. With few exceptions (such as blastomeres and eye lens cells), all cells in multicellular animals are designed to undergo apoptosis unless blocked by signals from other cells (Raff, 1996). This fact is used as evidence that it evolved very early in unicellular organs. A problem with all evolution scenarios is that apoptosis would benefit only multicellular organisms because it would end the gene line of a unicellular creature.

As far as is known, apoptosis functions in very similar ways in all life forms, and no evidence exists for the origin of apoptosis by evolution. Although the system varies somewhat in different life forms, a life form either has a complete, complex, functioning apoptosis system or lacks it entirely. Research on the apoptotic molecular machinery has shown that all protein domain architectures are based on the same "highly conserved" domains. This term "highly

conserved” simply means that the DNA code used to produce protein is very similar in both so called “primitive” and “advanced” life forms (Aravind et al., 2001)—a fact that strongly supports the conclusion that these basic domains were designed. In Darwinian terms, the apoptosis mechanism is “evolutionarily conserved” (Shi, 2002, p.459) meaning that a similar system is found throughout all life forms as would be expected if they were all created.

Apoptosis also supports the irreducibly complex supposition that postulates a certain level of complexity must exist for the system to function at all (Elmore, 2007). Because the process of apoptosis is similar in all organisms, significant similarity would be expected to exist between human apoptosis genes and those of the so-called “primitive” or “simple” animals. Proteins that have similar functions would be expected to have very similar designs in all organisms from worms to humans, and this is what is found. The apoptosis system is one more example of a detailed set of irreducibly complex biochemical mechanisms that have no Darwinistic explanation (Behe, 1996).

All of the estimated 200,000 kinds of proteins in humans must appropriately interact with each other so that each one can carry out its assigned function, while not interfering with the function of other proteins or cellular processes. If a single protein is altered, it could have adverse consequences on the entire cell. If the change renders the needed protein non-functional, a cell function will be prevented, and that would likely result in an altered protein, which would interfere with the function of other structures (Zubay et al., 1995; Yockey, 1992; Branden and Tooze, 1999). This chain of events is especially true for systems apparently designed to destroy a cell, such as apoptosis.

The discovery of apoptosis also argues against neo-Darwinism because this mechanism is lethal to the cell if all

the many checks and balances are not in place as a complete set. The enzymes and mechanisms that apoptosis use to destroy the cell, if not tightly controlled, can easily malfunction and damage or kill normal healthy cells, as sometimes does happen. Therefore, it is difficult to envision a Darwinian mechanism that enables mutations to develop the apoptosis system, yet keeps the system properly controlled and functional so as not to consistently destroy the very populations that apoptosis is supposedly evolving to benefit. As with the evolution of DNA repair mechanisms (Bergman, 2005), the activity of apoptosis would be antagonistic to the same evolutionary mechanism that supposedly constructed it.

Apoptosis and the “Selfish-Gene Hypothesis”

Apoptosis may be one evidence against the selfish-gene hypothesis, which postulates that the gene’s ultimate purpose is only to perpetuate itself. In this view, plant and animal bodies are only survival machines “created by our genes,” and the “predominant quality to be expected in a successful gene is ruthless selfishness” (Dawkins, 1976, p. 2). This ruthless selfishness of genes means that they “care” only about their own propagation, and ultimately use the whole body for their one goal. In Wilson’s words: “The organism is only DNA’s way of making more DNA” (1975, p. 3). More than any other contemporary scientist, Dawkins has popularized the idea that all living things are mere vehicles for genes, whose sole biological purpose is the propagation of their own DNA. Its basic thesis is that genes

swarm in huge colonies...safe inside gigantic lumbering robots, sealed off from the outside world, manipulating it by remote control. They are in you and me; they created us body and mind; and their preservation is the ultimate rationale for our

existence...we [the phenotypes or individual organism] are their survival machines (Dawkins, as quoted in Milner, 1990, p. 402).

This gene selectionism thesis has been so widely accepted that it is “frequently referred to simply as ‘modern Darwinism’” (Johnson, 2000, p. 106). Dawkins teaches that all activities of life exist ultimately for the purpose of preserving and spreading the ruthlessly selfish genes.

Evolution is a very plastic theory. Although Darwinists acknowledge that neo-Darwinism normally would tend to favor the survival of each cell so that it could pass on its genes, some have attempted to explain the apoptotic mechanism within the selfish-gene hypothesis (Dawkins, 1976). Dawkins noted that, if diseased cells die, the organism as a whole has a net advantage of living longer, and thereby passing its genes to its offspring. One problem with this explanation of apoptosis’ origin is that apoptosis is not critical in many cells until after the organism’s reproductive age is past. Another problem is that many of the numerous cells destroyed by apoptosis do not affect an organism’s survivability. Other methods that would be in harmony with the selfish-gene theory could achieve the same goal, such as having a more elaborate repair system and possessing more protection against cell damage so that fewer cells would need to be destroyed.

The body produces many structures by removal of cells, making the body, not the DNA, of greatest biological importance. If DNA were of the greater biological importance, a means would have been favored to evolve the required trait embryologically—a means that would be more in harmony with the selfish gene theory, rather than by relying on apoptosis to remove certain cells after they have developed. Apoptosis is actually a default option that must be bypassed in order for the cell to continue in its mitotic pathway. Unless overridden

by the proper signal, the cell will always enter apoptosis. This is contrary to what would be expected from a neo-Darwinism origin for the system.

Among the many other problems facing Dawkin's "selfish gene" theory is the fact that the genes by themselves are useless. They are only the software, and without the cell machinery involving hundreds of enzymes and complex structures such as the ribosomes (the "hardware"), life could not function. Genes are only part of the survival unit, and the complex cell organization as a unit is required for survival (Morange, 2002). The old central dogma was: DNA → RNA → proteins. The new dogma is: The genome as a unit → gene products → structure and function → pathways and physiology (Morange, 2002), all which fits with an origin by a creator.

Genes are also inactivated and controlled by non-genetic factors—a process called *epigenetic control*. The X chromosome dosage compensation in females, where one of the two X chromosomes in each somatic cell is randomly inactivated by methylation early in development, is an example. Margulis and Sagan (2002) make a strong case against the selfish gene hypothesis by arguing that the entire biosphere cooperates to the degree that it functions as a unit, a concept called the Gaia hypothesis (2002). They conclude that a gene is never "a self" but "only a piece of DNA long enough to have a function" and that the "time has come in serious biology to abandon words like 'selfish genes' and replace them with 'meaningful terms'" (Margulis and Sagan, 2002, pp. 16–17).

Summary

Recent research has found a "vastly" greater level of complexity in the genome than previously believed only a decade ago (Aravind et al., 2001). Apoptosis is an extremely complex

genetic and biochemical system that is only one of many examples where the genes put the organism first, not the reverse as Dawkins selfish gene model predicts. Neither the germ cell line nor the somatic cell line of the affected cell benefit because apoptosis destroys both forever; thus, only the organism can benefit. Often not only inferior cells die, as neo-Darwinism teaches, but cells that are either detrimental to the organism, or cells that are unneeded by the organism die because they are in the wrong place at the wrong time (Elmore, 2007).

Furthermore, evolution is unable to explain the origin of this system, which analysis has shown both the mechanism and the genes involved are very similar in all eukaryotes so far researched (Elmore, 2007). Thus, this supports the claim that apoptosis is irreducibly complex. Apoptosis is an extremely complex genetic and biochemical organization that is only one of many thousands of examples of an irreducibly complex system that regulates cell life for the benefit of the organism as a whole.

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References

- Abeles, R.H., P.A. Frey, and W.P. Jenks. 1992. *Biochemistry*. Jones and Bartlett, Boston, MA.
- Adams, J.M., and S.Cory. 1998. The Bcl-2 protein family: arbiter of cell survival. *Science* 281:1322–1325.
- Alberts, B. 2004. *Essential Cell Biology*. Garland Science, New York, N.Y.
- Aravind, L., V.M. Dixit, and E.V. Koonin. 1999. The domains of death: evolution

- of the apoptosis machinery. *Trends in Biochemical Sciences* 24:47–53.
- Aravind, L., V.M. Dixit, and E.V. Koonin. 2001. Apoptotic molecular machinery: vastly increased complexity in vertebrates revealed by genome comparisons. *Science* 291:1279–1283.
- Ashkenazi, A., and V.M. Dixit. 1998. Death receptors: signaling and modulation. *Science* 281:1305–1308.
- Barinaga, M. 1998. Death by dozens of cuts. *Science* 280:32–34.
- Behe, M. 1996. *Darwin's Black Box*. The Free Press, New York, NY.
- Bergman, J. 1998. The unbridgeable chasm between prokaryotes and eukaryotes, pp. 67–79 in *The Fourth International Conference on Creationism*. Edited by R.E. Walsh. Pittsburgh, PA.
- Bergman, J. 2005. The mutation repair systems: A major problem for macroevolution. *Creation Research Society Quarterly* 41:265–273.
- Blackstone, N.W., and D.R. Green. 1999. The evolution of a mechanism of cell suicide. *Bioassays* 21:84–88.
- Branden, C., and J. Tooze. 1999. *Introduction to Protein Structure*. Garland, New York, NY.
- Dawkins, R. 1976. *The Blind Watchmaker*. Norton, New York, NY.
- Dexter, T.M., M.C. Raff, and A. H. Wyllie (Ed). 1995. *The Role of Apoptosis in Development, Tissue Homeostasis and Malignancy*. Chapman and Hall, New York, NY.
- Duke, R.C.; D.M. Ojcius, and J.D.E. Young. 1996. Cell suicide in health and disease. *Scientific American* 275:80–87.
- Elmore, S. 2007. Apoptosis: a review of programmed cell death. *Toxicologic Pathology* 35(4):495–516.
- Fesik, S.W. 2000. Insights into programmed cell death through structural biology. *Cell* 103:273–282.
- Golstein, P., D.M. Ojcius, and J.D.E. Young. 1991. Cell death mechanisms and the immune system. *Immunological Reviews* 121: 29–65.
- Gregory, C.D. (Editor). 1995. *Apoptosis and the Immune Response*. Wiley-Liss, New

- York, NY.
- Gross, A., J.M. McDonnell, and S.J. Korsmeyer. 1999. BCL-2 family members and the mitochondria in apoptosis. *Genes and Development* 13:1899–1911.
- Hartwell, L., and M. Kastan. 1994. Cell cycle control and cancer. *Science* 266:1821–1827.
- Hartwell, L., and T.A. Weinert. 1989. Checkpoints: controls that ensure the order of cell cycle events. *Science* 246:629–633.
- Hengartner, M.O. 1998. Death cycle and Swiss army knives. *Nature* 391:441–450.
- Hengartner, M.O. 1998a. Injected cytochrome C induces apoptosis. *Nature* 391:449–450.
- Hengartner, M.O. 2000. The biochemistry of apoptosis. *Nature* 407:770–775.
- Huang, D.D.C., and A. Strasser. 2000. BH3-only proteins—essential initiators of apoptotic cell death. *Cell* 103:839–842.
- Johnson, P. 2000. *The Wedge of Truth*. InterVarsity Press, Downers Grove, IL.
- Kerr, J.F.R., A. H. Wyllie, and A.R. Currie. 1972. Apoptosis: a basic biological phenomenon with wide-ranging implications in tissue kinetics. *British Journal of Cancer* 26: 239–257.
- Korsmeyer, S.J. 1995. Regulators of cell death. *Trends in Genetics* 11:101–105.
- Krakauer, D.C., and R.J. Payne. 1997. The evolution of virus-induced apoptosis. *Proceedings of the Royal Society of London. Series B: Biological* 264:1757–1762.
- Kroemer, G. 1997. Mitochondrial implication in apoptosis: towards an endosymbiont hypothesis of apoptosis evolution *Cell Death and Differentiation* 4:443–456.
- Lewin, B. 1997. *Genes VI*. Oxford Oxford University Press, New York, NY.
- Lewis, R. 2000. *Genetics*. McGraw Hill, New York, NY.
- Maddika, S., S.R. Ande, S. Panigrahi, T. Paranjothy, K. Weglarczyk, A. Zuse, M. Eshraghi, K.D. Manda, E. Wiechec, and M. Los. 2007. Cell survival, cell death and cell cycle pathways are interconnected: implications for cancer therapy. *Drug Resistance Updates* 10:13–29.
- Margulis, L., and D. Sagan. 2002. *Acquiring Genes; A Theory of the Origin of Species*. Basic Books, New York, NY.
- Martin, S.J., and D.R. Green. 1995. Protease activation during apoptosis: death by a thousand cuts? *Cell* 82:349–352.
- McColl, A., S. Michlewska, I. Dransfield, and A.G. Rossi. 2007. Effects of glucocorticoids on apoptosis and clearance of apoptotic cells. *The Scientific World Journal* 7:1165–1181.
- Medina, J.J. 1996 *The Clock of Ages*. Cambridge University Press, New York, NY.
- Mercer, J., M. Mahmoudi, and M. Bennett. 2007. DNA damage, p53, apoptosis and vascular disease. *Mutation Research* 621:75–86.
- Milner, R. 1990. *The Encyclopedia of Evolution*. Facts on File, New York, NY.
- Morange, M. 2001. *The Misunderstood Gene*. Harvard University Press, Cambridge, MA.
- Affara, M., B. Dunmore, C. Savoie, S. Imoto, Y. Tamada, H. Araki, D.S. Charnock-Jones, S. Miyano, and C. Print. 2007. Understanding endothelial cell apoptosis: what can the transcriptome, glycome and proteome reveal? *Philosophical Transactions of the Royal Society of London Biology Science*. 362(1484):1469–87
- Raff, M.C. 1996. Death wish. *The Sciences* 36(4):36–40.
- Rupinder, S.K., A.K. Gurpreet, and S. Manjeet. 2007. Cell suicide and caspases. *Vascular Pharmacology* 46:383–393.
- Sharon, J. 1998. *Basic immunology*. Williams and Williams, Baltimore, MD.
- Shi, Y. 2002. Mechanisms of caspase activation and inhibition during apoptosis. *Molecular Cell* 9:459–470.
- Steller, H. 1995. Apoptosis: mechanisms and genes of cellular suicide. *Science* 267: 1445–1449.
- Veggeberg, S.K. 1995. Cell suicide research may yield life-saving cures. *BrainWork* 5:4–6.
- Wang, X.W, H. Yeh, L. Schaeffer, R. Roy, and V. Moncollin. 1995. P53 modulation of TF11H associated nucleotide excision repair activity. *Nature Genetics* 10:188–195.
- Weinrauch, Y., and A. Zychlinsky. 1999. The induction of apoptosis by bacterial pathogens. *Annual Review of Microbiology* 53:155–187.
- Wiens, M., A. Krasko, C.I. Muller, and W.E. Miller. 2000. Molecular evolution of apoptotic pathways: cloning key domains from sponges (Bcl-2 homology domains and death domains) and their phylogenetic relationships. *Journal of Molecular Evolution* 50:520–531.
- Williams, G.T. and C.A. Smith. 1993. Molecular regulation of apoptosis: genetic controls on cell death. *Cell* 74:777–779.
- Wilson, E.O. 1975. *Sociobiology: the New Synthesis*. Harvard University Press, Cambridge, MA.
- Wu, J. 1996. Apoptosis and angiogenesis: two promising tumor markers in breast cancer. *Anticancer Research* 16: 2233–2239.
- Yockey, H. 1992. *Information Theory and Molecular Biology*. Cambridge University Press, New York, NY.
- Zamzami, N., and G. Kroemer. 2001. The mitochondrion in apoptosis: how pandora's box opens. *Nature Reviews* 2:67–71.
- Zubay, G. 1995. *Principles of Biochemistry*. Wm C. Brown, Dubuque, IA.



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Book Review

Dinosaurs: Where Did They Come from... Where Did They Go?

by Elaine Graham-Kennedy

Pacific Press Publishing Association, Nampa, ID, 2006, 80 pages, \$12.00.

This is a well-illustrated children's book with many interesting details on dinosaur bones, tracks, and eggs. Dr. Elaine Graham-Kennedy recently retired from the Geoscience Research Institute (GRI) at Loma Linda University. She has traveled worldwide in her study of dinosaurs and has considerable expertise for writing a book on dinosaurs.

The author describes the two categories of dinosaurs based on their hip bones, the sizes of dinosaurs (many are small), the difference in the ends of the bones between young and adult dinosaurs, dinosaur brains, characteristics of

the teeth, and the worldwide discoveries of tracks and eggs. The dinosaur data is often incomplete, and because of this, the author is conservative, seemingly overcautious, in her interpretations of the data on dinosaurs.

Based on field experience, Graham-Kennedy considers that most dinosaur eggs have been transported by water, which fits in well with the Flood model. Some readers versed in common creation theories will find some of the ideas controversial, such as the possibility that behemoth as described in Job 40 is *not* a dinosaur. Although not dogmatic about it, the reasoning is because behemoth's tail "sways *like* a cedar." The text does not say

the tail was the size of a cedar, although I would envision the tail as large. Also, behemoth lies underneath the lotus plant, hidden among the reeds of the marsh (Job 40:21 NIV). Could a sauropod dinosaur lie beneath a lotus plant? She likes to make the reader think, emphasizing that we must incorporate all the data of Scripture and paleontology.

This book is available from Creation Research Society Books. You can either order by phone from the Van Andel Creation Research Society lab at 1-877-277-2665 or order online under www.creationresearch.org.

Michael Oard



Book Review

In the Beginning

2007, A musical by Sight and Sound Theatres, Strasburg, PA.

Sight and Sound Theatres present large-scale Christian musical productions. Featured are casts of dozens, live animals, professional stagecraft, and special effects. Theatres are located near Harrisburg, Pennsylvania, and will soon be duplicated in Branson, Missouri. Previous biblical productions include the stories of Noah, Ruth, and Daniel.

For the production *In the Beginning*, how are biblical origins treated by Sight and Sound? In a word, outstanding. The

Garden of Eden scenes feature animals living together in harmony. Dinosaurs are included, and they move about freely using advanced animatronics. Adam and Eve appear as supernatural creations, living in close fellowship with their Maker until the Fall. The lifetimes of our first parents are dramatized with imagination and humor. Many children are born to them over the centuries, in agreement with Genesis 5:4. In one scene, family members travel across the 300-foot stage driving a large wagon, pulled by a full-size, lifelike, woolly mammoth.

In the Beginning emphasizes that all of history covers about 6000 years. The presentation concludes with a clear messianic gospel message. This unique musical initially played for seven months, April–October, 2007. With a seating capacity of 2000, and multiple, daily, full-house presentations, the creation story reached around one million visitors. The exciting story of Creation is heard loud and clear in Pennsylvania.

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Clays of the Central Georgia Kaolin Belt: A Preliminary Evaluation

John Reed, Carl R. Froede, Jr.*

Abstract

Clays of the Central Georgia kaolin belt comprise a significant percentage of commercial grade kaolin produced worldwide. Kaolin lenses occur in terrestrial Coastal Plain sediments in east-central Georgia, in updip sections near the Fall Line. Uniformitarian models of the clay's origin suggest the following sequence occurring over millions of years: (1) kaolinite minerals slowly formed as weathering products of updip igneous and metamorphic rocks of the Piedmont and Appalachian provinces, (2) kaolinite was transported by rivers to the ancient coastline, and (3) extensive, slow post-depositional changes resulted in nearly pure kaolin bodies. However, present theories are troubled by a number of inconsistencies and the diluvial paradigm may prove more fruitful for understanding the occurrence of the clay. Though a diluvial model is not presented, bounding parameters and key questions for such a theory are proposed.

Introduction

Kaolin is a white plastic clay composed of various minerals of the kaolinite group. Its name comes from its early use at Kao-Lin in China—it is often called “China Clay.” When found in sufficient purity, kaolin is useful in many commercial applications. It forms the coating on the pages of this magazine, is an ingredient in tires, paint, and even food. Both your toilet and your antique china are made with kaolin. It is used as a refractory material, a catalyst, and as filler in cement and fiberglass. Its unique

properties, especially its bright white color, make it an important economic resource. Mining constraints are rigid; small changes in the makeup of a clay lens can change its physical properties significantly and make or break a potentially viable deposit. Even among the comparatively pure deposits of the Central Georgia kaolin belt, less than one percent of the total clay bodies explored are considered commercial grade (Pickering et al., 2000).

Kaolin is composed of minerals of the kaolinite group, including kaolinite,

dickite, nacrite, and halloysite. They often occur as microscopically stacked plates similar to the micas, but kaolin is a much simpler aluminosilicate. Its basic formula is $\text{Al}_2\text{Si}_2\text{O}_5[\text{OH}]_4$. Because it is the diagenetic end product of micas, volcanics, and other clays, kaolinite is common in many sedimentary rocks, but it forms deposits of commercial quality kaolin in only a few places; notably Australia, Brazil, China, Ethiopia, England, and in central Georgia. The Central Georgia kaolin belt has been the world's center of commercial kaolin mining for many years because it contains large bodies of very pure clay that are easily extracted through open pit mining operations, although in recent years, increasing production costs and the reduction in the volume of the economic deposits has shifted more kaolin production to Brazil.

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In Georgia, kaolin is mined from open pits; the commercial lenses range up to 150 ft (45-m) thick, and extend across many acres (Figure 1). Mines typically yield between 50,000 and 400,000 tons (45.4 to 363 metric tons) of clay (Pickering et al., 2000). The origin of these pure clay deposits in Georgia

remains unresolved. In other locations, commercial deposits have clearly been formed diagenetically from the alteration of igneous rocks. Kaolin clay has also been observed as a direct alteration product (Chen et al., 1997; Cravero et al., 2001; Pickering et al., 2003), often by hydrothermal activity. Kaolinite is a

common product of plagioclase feldspar or mica alteration, especially under the influence of acidic pore fluids. It is also a diagenetic end product of other clays, such as smectite.

However, the origin of the clay bodies in the Central Georgia kaolin belt presents problems, not only because they are large, pure, and abundant, but because they are also part of a continuous sedimentary sequence. Kaolin is abundant in the surrounding sediments as matrix and as framework clasts. Many of these framework clasts may be from the in situ alteration of feldspars after deposition, but in some cases kaolin clay beds have clearly been ripped up by erosion and redeposited (Figure 2). Until recently, emphasis had been placed on a depositional origin for the clay bodies; now the focus has moved to diagenetic processes (Hurst and Pickering, 1997). But questions remain. All current theories assume deep time and low-energy paleoenvironments similar to modern coastal settings. It is possible that a new perspective—relatively rapid formation in a catastrophic setting—may solve some longstanding problems and open new areas of research. This paper



Figure 1. The Imerys Company Sheppard Mine exhibits all of the stratigraphic units associated with the central Georgia kaolin mining industry. Note the people located on the lower left side of the image for scale. Image from October 2000.

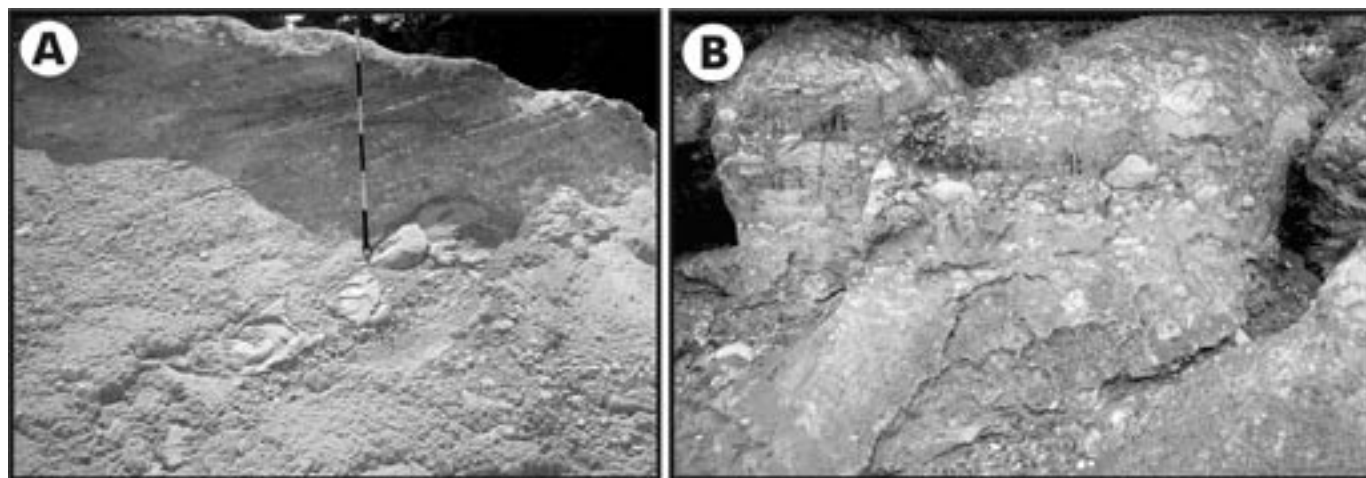


Figure 2. Huber Member kaolin clasts in a sandy-kaolin clay matrix. (A) These clay balls show evidence of transport but are not obviously armored. This suggests rapid transport in a fluidized state. This would require extremely energetic conditions, much higher than the posited fluvial setting. Scale in 6 in (15 cm) divisions. (B) The layering of the kaolin suggests normal-graded bed load transport. The successive levels of graded bedding suggest transport and deposition in a series of pulses rather than as a continuous process. Scale in inches and centimeters.

will review the geology of the Central Georgia kaolin belt, evaluate uniformitarian models, and propose constraints on potential diluvial theories.

Geology of the Kaolin Belt

The Central Georgia kaolin belt is located just to the south of the Fall Line, between Macon and Aiken, South Carolina (Figure 3). The Fall Line stretches from New Jersey to Texas, and is the surface expression of a significant erosional unconformity cut into igneous and metamorphic rocks of the crystalline basement (exposed up dip in the Piedmont Province), and beneath sediments of the Coastal Plain Province. Coastal Plain sediments form a wedge from their pinchout at the Fall Line to thicknesses of many thousands of feet beneath the continental shelf (see Froede, 1997). Updip Coastal Plain sediments are composed of unconsolidated gravels, sands, silts, and clays, with rare calcareous beds. In the kaolin belt, many updip facies are interpreted as terrestrial in origin and downdip facies are interpreted as marine, though some of the younger marine strata extend nearly to the Fall Line (see Appendix).

Uniformitarians date the oldest Coastal Plain strata in the area as Late Cretaceous, based primarily on fossil pollen spores. Most strata exposed at the surface in the kaolin belt are dated as the Late Eocene Barnwell Group. However, dating and correlation of all the sediments are hindered by the absence of fossils in many critical formations, abrupt lateral lithologic transitions, similarities between sediments in different formations, unresolved nomenclature, and rare exposures. Much of the dating is done by reference to pollen zones.

The stratigraphically lower Cretaceous kaolin is called “soft kaolin” and is mineralogically distinct from the overlying Eocene or “hard” clays (Figure 4). The soft kaolin is the primary economic resource of the area; nearly 70%



Figure 3. Map of the Central Georgia Kaolin Belt and surrounding areas. Counties comprising the kaolin belt are shaded in light gray, as is the Department of Energy Savannah River Site. Granite outcrops north of the Fall Line are shaded in darker gray.

Soft Kaolin	Hard Kaolin
Found in commercial deposits only in Buffalo Creek Fm. (Cretaceous); found in Marion Member of Huber Formation in non-commercial lenses	Found in Huber Fm. (Eocene)
Conchoidal fracture	Rough or earthy fracture
Rare to no trace fossils	Common marine trace fossils
Fresh water fluvial-deltaic deposition	Brackish water marginal marine deposition
Heavily recrystallized, probably by inorganic processes	Organic alteration greater than chemical; less heavily recrystallized
Coarse booklets of crystals in matrix of thin kaolinite plates, packed face to edge	Fine particles tightly packed face to face
Lower iron, titanium impurities; relative to particle size	Higher iron, titanium impurities; iron not relative to particle size
X-ray diffraction shows well-defined peaks that indicate low concentrations of structural defects	X-ray diffraction shows poorly-defined peaks that indicate more common translation defects

Figure 4. Differences between “hard” and “soft” commercial kaolin deposits. From Pickering et al. (2000).

of Georgia kaolin is of the soft, coarse particulate type. In some instances they are separated by organic-rich clays, some even considered lignitic (Figure 5).

Stratigraphic Summary

Upper Coastal Plain stratigraphy is marked by some uncertainty. It has been refined over recent decades, but questions remain. Pickering et al. (2000) identified ten stratigraphic units in the kaolin belt. Of these, commercial clay occurs only in two. The general kaolin belt stratigraphy is shown in Figure 6 and summarized below. Lateral facies variations account for disagreements between stratigraphers as do subjective nomenclature differences between locations. The United States Department of Energy Savannah River Site lies just within South Carolina (Figure 3), and its upper Coastal Plain nomenclature is quite different from that of the kaolin belt (Figure 7) between the basement and the Barnwell Group. Some of the differences are undoubtedly in the rocks, but others may also be artifacts of stratigraphers' subjectivity.

The oldest rocks beneath the kaolin belt are the Piedmont Crystalline Rock Complex, which include gneiss, amphibolite, schist, phyllite, and intrusive granites and mafic rocks. The metamorphic rocks are thought to be Precambrian and the igneous intrusives are dated to the middle Paleozoic. Where they are exposed, these basement rocks are often covered by a layer of saprolite, up to 165 ft (50 m) thick. Saprolite is an alteration product probably resulting from in situ weathering since it often retains remnants of the original rock texture and residual quartz veins. In every current uniformitarian theory of the origin of kaolin, this saprolite is identified as the precursor material of the commercial clay accumulations. The top of the saprolite (or crystalline basement where the saprolite is absent) marks the Fall Line Unconformity. The slope of the basement at the Savannah River aver-

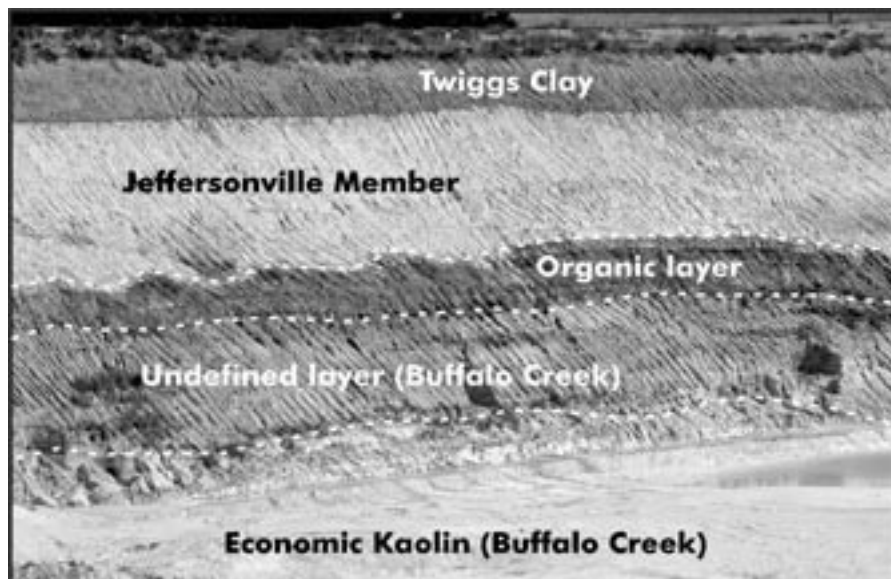


Figure 5. This sidewall at the Thiele Avant Mine shows the Buffalo Creek Formation, an organic rich clay layer, and the Jeffersonville Member of the Huber Formation. At many locations, an organic layer overlies or underlies economic kaolin deposits. This sidewall is approximately 50 ft (15 m) high. Image from October 2000.

Age	Group	Formation	Member	Description	
Miocene	—	Altamaha	—	Sand, clay, and gravel, only in eastern Georgia	U
Late Eocene	Jackson or Barnwell Group	Twiggs Clay	—	Smectite clay, fuller's earth, marine fossils	U
		Clinchfield Sand	Treadwell & Riggins Mill	Fine grained sand with marine fossils	
Early-Middle Eocene	Oconee Group	Huber	Jeffersonville	Fining up sequences with "hard" kaolin lenses on top	U
Late Paleocene			Marion	Clayey sands with soft dark kaolin; abundant lignite	U
Latest Cretaceous	—	Buffalo Creek	—	Fining up sequences capped by "soft" kaolin	U
Late Cretaceous	—	Pio Nono Formation	—	Gravel base, arkosic, clayey sands; no kaolin deposits	U
Paleozoic - Precambrian	Igneous/metamorphic basement, commonly capped by saprolite				U

Figure 6. Uniformitarian stratigraphic chart of the Central Georgia Kaolin Belt. Shaded units show location of commercial clay deposits. Solid lines marked by "U" depict regional unconformities important to stratigraphic correlation. The lowest is the Fall Line unconformity. Note that some units are restricted by geography and may indicate facies relationships rather than true age relationships. Modified from Pickering et al. (2000) and Hetrick and Fridell (1990).

Period	Epoch	Stage	Savannah River Site		Kaolin Belt	
			Group	Formation	Group	Formation
Neo.	Mioc.			Hawthorn		Altamaha
Paleogene	Eocene	Priabonian	Barnwell	Tobacco Road	Barnwell	Tobacco Road
				Dry Branch		Irwinton Sand
				Clinchfield		Twiggs Clay
						Clinchfield
		Bartonian	Orangeburg	Santee/McBean	Oconee	Huber
				Warley Hill		
				Congaree		
	Paleoc.	Lutetian	Black Mingo	Fishburne		
		Ypresian		Williamsburg		
		Thanetian		Ellenton		
		Selandian				
		Danian				
Cretaceous	Late	Maastrichtian	Lumbee	Steel Creek		Buffalo Creek
		Campanian		Black Creek		
		Santonian		Middendorf		Pio Nono
		Coniacian		Cape Fear		

Precambrian and Paleozoic Crystalline Basement

Figure 7. Stratigraphic charts of Coastal Plain sediments between the Central Georgia kaolin belt and the United States Department of Energy Savannah River Site near Aiken, South Carolina. The differences beneath the Barnwell Group are surprising, since the two areas are located approximately along strike and within 100 miles of each other. Both areas have large amounts of well and core data to support interpretation. Differences can probably be explained by facies changes along strike and interpretive subjectivity of different workers. Shaded areas represent unconformities.

ages 40 ft/m (7.58 m/km), decreasing up through the sedimentary section to 15 ft/m (2.84 m/km) on top of the kaolin bearing Eocene sediments (Hetrick and Fridell, 1990). The slope decreases to the west and downdip (Hurst and Pickering, 1997, their figure 5).

Immediately overlying the basement/saprolite is the Pio Nono Formation, composed of coarse red, brown, and yellow gravels, arkosic sands, and clays. Its type locale is Macon, and the formation is assumed to be basal Late Cretaceous,

despite the absence of fossils. Huddleston and Hetrick (1991) included this formation in the Oconee Group, but Pickering et al. (2000) were uncertain, since it lacks commercial grade kaolin and the gravel-sized clay balls common in other Oconee Group sediments. They noted a “subtle unconformity” between the Pio Nono Formation and the overlying Oconee Group.

The Oconee Group is a relatively recent name replacing the informal “Tuscaloosa Formation” dating back to

the early 1900s. It ranges from the Late Cretaceous to the Middle Eocene. All commercial-grade kaolin occurs in two strata of the Oconee Group; the Buffalo Creek Formation and the Jeffersonville Member of the Huber Formation. The type locale for the Oconee Group is along the Oconee River in Wilkinson and Washington Counties. It is composed of “fining-upward sand/clay sequences over a wide range of geologic time from Early Late Cretaceous to Middle Eocene” (Pickering et al., 2000, p. 8). The bases of these fining-upward units often include beds of gravel or kaolin ball clasts that grade up into sands with large cross beds up to 80 ft (24.4 m) thick. The tops of these sequences are kaolin lenses, often of commercial grade. The commercial lenses range from a few square feet up to hundreds of acres, and can reach 150 ft (45.7 m) in thickness. Terrestrial facies extend from the erosional pinchout at the Fall Line to 20–35 miles (32–56 km) to the southeast. The terrestrial Oconee sediments reach a thickness of more than 2,500 ft (762 m) at that transition (Pickering et al., 2000).

The Buffalo Creek Formation forms the basal Oconee Group (Pickering and Hurst, 1989). Based on pollen dating, it is late Campanian and is the updip equivalent of the marine Ripley Formation. It is composed of fining upward channel fills which include cross bedded quartz gravel, kaolin clast gravel, sand, silt, and clay, including large commercial lenses (Figure 8). The soft kaolin of the Buffalo Creek Formation is usually cream to white, and occasionally pink, gray, violet, or yellow. The top of the formation marks a major regional unconformity, marked by early Paleocene erosion that cuts into commercial clay bodies, although it is less prominent than those atop the basement or the Huber Formation.

The Huber Formation was named by Buie and Fountain (1967) to distinguish generally finer-grained clayey

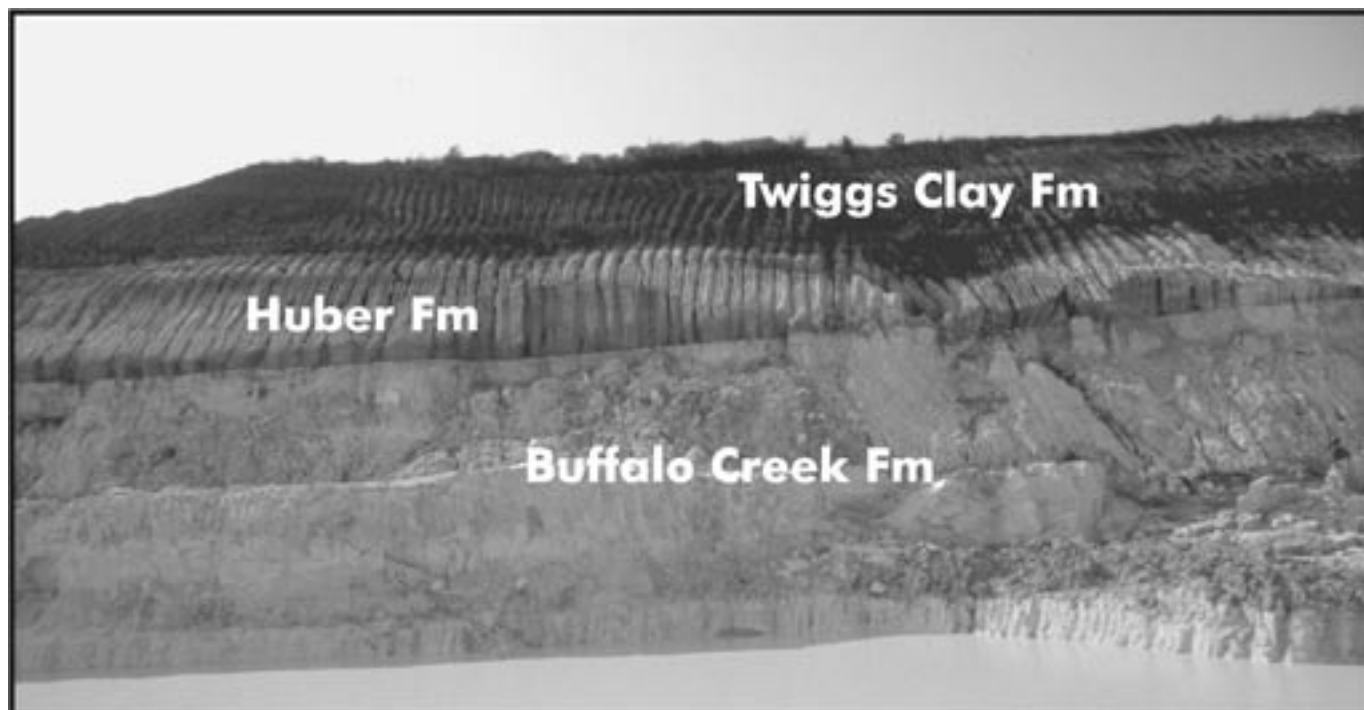


Figure 8. This close-up view of the mine sidewall from Figure 1 shows the clay purity typical of the Buffalo Creek Formation. Note the sharp contact between the Buffalo Creek Formation and the overlying Huber Formation. Man (to right) for scale. Image from October 2000.

sand from the underlying Cretaceous sediments, though its sediments also form a series of fining upward, cross-bedded sand-clay cycles. It differs from the Buffalo Creek Formation by being thinner, having finer-grained sands, more heavy minerals, and pollen of late Paleocene to Eocene age. Huber Formation kaolins are of finer particle size, are less recrystallized, less oxidized, grayer, and contain more lignite than the Buffalo Creek clays. The formation is found between Andersonville and Hepzibah, illustrating how lateral variation influences stratigraphy. Interestingly, similar sediments are found in a fault-bounded basin near Warm Springs and in the Piedmont of northwest Georgia:

Further, palynology studies by Darrell (1966) of numerous bauxite and kaolin filled limesinks in Cambrian

rocks in Northwest Georgia show considerable lithologic and biostratigraphic similarity to the Huber Formation (Pickering et al., 2000, p. 11).

The Huber Formation consists of the lower Marion Member—generally richer in organics with abundant lignite seams—and the upper Jeffersonville Member, which contains the upper commercial clays. The Marion Member includes at least one fining upward sequence, from a basal quartz and kaolin-clast conglomerate atop the eroded Buffalo Creek, to a dark clay that is often rich in pyrite, organic matter, and lignite seams (Figure 9). The boundary with the overlying Jeffersonville Member is a “subtle unconformity and not easily distinguished” (Pickering et al., 2000, p. 11). This is unusual; present day conditions create significant relief within

fluvial valleys and thick soil horizons on the interfluve surfaces.

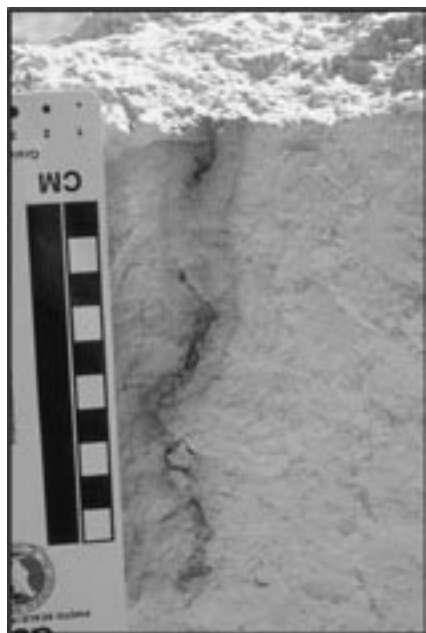
The Jeffersonville Member consists of fining upward cycles of sand to hard clay lenses, which contain traces of shrimp and other brackish water fauna (Figure 10). Microscopic examination shows evidence of significant bioturbation. This stratum is dated to the Middle Eocene by pollen. The top of the member is a prominent unconformity that marks a shift to marine deposition. There is no commercial-grade kaolin above that unconformity.

The Barnwell Group or Jackson Group (depending on the author) is dated to the Late Eocene and contains marine sediments. The type locale is in Barnwell, South Carolina. It is composed of the lower Clinchfield Sand Formation, the Tobacco Road Sand, and the Twiggs Clay Formation (Hetrick and



above: Figure 9. Lignite rich lenses in the Huber Formation at the Thiele Ennis Mine. The exposure is approximately 40 ft (12 m) high. Image from March 1999.

below: Figure 10. Pyritized vertical shrimp(?) trace in the Jeffersonville Member. The density of the clay and lack of shortening of the trace suggests limited compaction. Scale in centimeters.



Fridell (1990) defined the lower unit of the Barnwell Group as the Dry Branch Formation, which includes the Twiggs Clay, Irwinton Sand, and Griffins landing Members). In the kaolin-mining district, the Barnwell Group is exposed or locally covered by recent alluvium. The Clinchfield Sand Formation is best seen in its type locale in Houston County and extends east to Deepstep. It has also been called the “Albion Member” and is an opal cemented sand and clay called the “flint clay,” which contains shark and fish teeth, mollusks, and small pectens. Harris (2003) suggested that this member might include

fallout debris from the Chesapeake Bay impact event. The overlying Twiggs Clay Formation is a relatively continuous, thick layer of marine fuller’s earth, ranging from Cordele to Hepzibah. Hetrick and Fridell (1990) interpreted the depositional environment of the Twiggs Clay as intertidal mud flats because it consists of fissile smectite with laminae of silt and sand, contains pelecypods and abundant plant fossils, and includes facies of fuller’s earth, smectite, and cristobalite. It is present as overburden in most kaolin pits. The Twiggs Clay is important in recent theories of kaolin formation because it

is thought to form a groundwater barrier to downward recharge in areas that correlate with gray, pyrite-rich kaolin, while in areas where the Twiggs Clay is breached, the underlying kaolin is heavily oxidized to white, pink, purple, or tan (Yuan, 2000).

The Tobacco Road Sand is the uppermost formation of the Barnwell Group. It is a medium-grained sand that is often cross-bedded. It contains discontinuous clay laminae, and a basal zone of flattened, rounded small gravel. It is interpreted as a shoreline deposit. The Tobacco Road Sand weathers to a reddish brown, and is marked by *Ophiomorpha* burrows. Its type locale is Fort Gordon, near Augusta (Hetrick and Fridell, 1990).

In far eastern Georgia, the Miocene Altamaha Formation of the Hawthorne Group is present. It is a pebbly, poorly sorted sand, clay, and gravel, thought to be of fluvial to estuarine origin. Its lower bed is 2–6 ft (0.61–1.8 m) thick, and composed of gray-green silty sandy clay. In many cases, it is difficult to distinguish the lower Altamaha from the underlying Tobacco Road Sand. Often stratigraphers must rely on elevation and location (Hetrick and Fridell, 1990) to differentiate the two units. The upper part of the Altamaha is composed of gravel beds with angular to rounded clasts, some more than two inches in diameter.

Regional Unconformities

Stratigraphic correlation is difficult in the upper Coastal Plain. In addition to the physical lack of outcrops and restricted access to proprietary subsurface data, the sediments lack diagnostic fossils. Correlation rests on subsurface regional unconformity surfaces. There are three such unconformities: (1) the boundary between the crystalline basement and the Pio Nono or Buffalo Creek formations, (2) the boundary between the Buffalo Creek and Huber formations, and (3) the boundary between the

Jeffersonville Member and the Barnwell Group (Figure 6).

This focus on unconformities pushes the uniformitarian interpretation towards the principles of sequence stratigraphy. This approach is emphasized because commercial clay occurrence is theoretically tied to fluctuations between terrestrial and marine environments (Hurst and Pickering, 1989). The lowstands that generated these unconformities are thought to be significant, as are their intervening highstands in the Late Cretaceous and Eocene that match the dating of kaolin-bearing strata. An additional highstand in the Late Eocene is thought to correlate to the deposition of the Twiggs Clay (Pickering et al., 2000).

Kaolin Composition

Commercial grade kaolin in the kaolin belt generally contains 90–95% kaolin group minerals and 5–10% impurities. In addition to kaolinite, nacrite and dickite, all of the Georgia kaolin group clay minerals occur in both hard and soft varieties, although in soft clays they are confined to the fine particle size fraction. Impurities in commercial grade kaolins include mica, illite (an alteration product of mica), smectite, pyrite, marcasite, and iron and titanium oxides such as anatase, goethite, and hematite. Organic content varies; it is usually higher in hard clays and in downdip clays.

Of the hard and soft varieties of kaolin, each type displays an apparent stratigraphic affinity. Soft kaolin is restricted to the Buffalo Creek Formation. It is characterized by its coarse particle size, soapy texture, and conchoidal fracture. Soft clay is thought to be the result of extensive in situ recrystallization. It is also called “low defect kaolin” because of its well-defined X-ray diffraction peaks. Hard kaolin is found in the Jeffersonville Member of the Huber Formation. It is characterized by its finer particle size, earthy texture, and

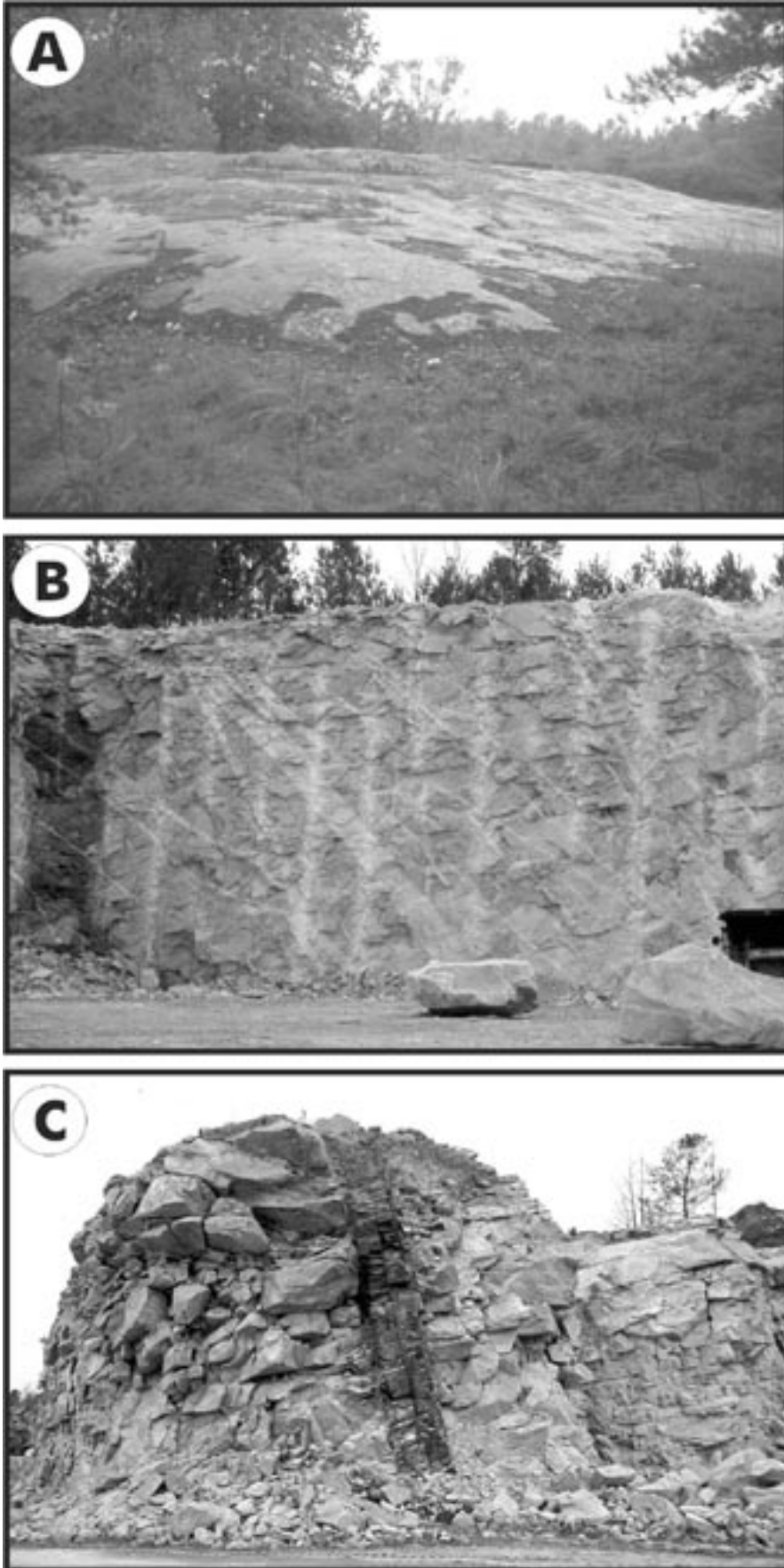
evidence of little in situ recrystallization. It is thought to have formed by flocculation in marginal marine settings, and is also called “high defect kaolin” because of its broad X-ray diffraction bands which result from crystallographic translation defects. Soft clay is noted for its low iron content (0.1–0.45%), while hard clay’s iron content ranges between 0.7–1.0%. A similar stratigraphic occurrence of soft and hard kaolin is found in the Capim River kaolins of Brazil (Sousa et al., 2006).

Discussion

Uniformitarian Theories

There are several possible methods of forming kaolinite clay minerals, almost all of which are diagenetic. Kaolinite minerals can form by the in situ diagenetic and hydrothermal alteration of feldspar-rich igneous and metamorphic rocks, such as granite and rhyolite, as documented in Ethiopia (Fentaw and Mengistu, 1998), Argentina (Cravero et al., 2001), and China (Chen et al., 1997). Kaolinite is also thought to form by intense weathering (Sousa et al., 2006). It is the primary component of saprolite forming in the Georgia Piedmont (Pickering et al., 2003). Of particular interest is the Sparta Granite (Figure 11), an intrusive belt 50 miles (80 km) long, just updip of the Georgia kaolin belt (Pickering et al., 2003).

The Georgia kaolins are thought to have formed by a complex combination of several methods, all-originating with the saprolite that covers Piedmont rocks. Once formed, the saprolite would have been transported by rivers to the ancient coast and deposited as lenses of less pure kaolin (~80%) in marginal marine lagoons and deltaic ponds. Those lenses were later refined by a series of diagenetic processes: weathering, winnowing, bacterial action, and oxic and anoxic groundwater action (Hurst and Pickering, 1997).



left: Figure 11. The feldspar-rich Sparta Granite is thought to be a source of Coastal Plain kaolin. (A) A weathered outcrop of southeast of Macon, Georgia. (B) A 40 ft (12 m) sidewall in an open pit mine where the Sparta Granite is mined for aggregate. Note the extensive feldspar dikes cross-cutting the granite. There is no free iron in this rock and it would naturally weather to kaolin clays in an acidic environment. (C) A 40 ft (12 m) sidewall of the Sparta Granite cross-cut by a diabase dike. The dike is approximately 5 ft (1.5 m) wide. Uniformitarians date the diabase as Jurassic (~190 Ma) and the Sparta Granite as Pennsylvanian (~300 Ma).

As might be expected, the continuity of environment, climate, and processes are emphasized:

These kaolins (and associated bauxites) are located on what has been a passive continental margin for the last 100 my (Hurst and Pickering, 1997, p. 277).

Therefore, the initial conditions of the clay deposits are extrapolated from present day mud content of local river systems:

Essentially the same patterns of drainage and relief have existed since Cretaceous time.... Kaolinite-metahalloysite has been the dominant component of detritus from the source area since Cretaceous time (Hurst and Pickering, 1997, pp. 279, 280).

Given these initial conditions, it follows that a multimillion-year process of clay polishing by various diagenetic processes would result in the present-day commercial kaolin deposits.

Yuan (2000) summarized recent theories of the origin of commercial

kaolin in east-central Georgia, noting the mysterious nature of these deposits:

Even though numerous studies have been devoted to understanding the genetic relationships of the different types of kaolin, there is still no universally accepted explanation for their origin (Yuan, 2000, p. 37).

Next, he noted two key phenomena that must be explained: (1) why there are hard and soft varieties of clay, and (2) the relative roles of deposition and diagenesis in the formation of commercial grade kaolin. However, there is another key aspect that Yuan (2000) failed to mention—the restricted geographic extent of commercial clays relative to the widespread conditions under which they supposedly formed. In other words, why are commercial grade deposits not found elsewhere in Georgia, North Carolina, South Carolina, Alabama, or Mississippi? Hurst and Pickering (1997) attributed it to the slightly higher percentage of suspended load kaolinite carried in modern Georgia rivers, but provided no geochemical basis for correlating such a threshold to commercial deposits.

All theories revolve around three key factors: (1) source, (2) depositional environment, and (3) diagenetic history (Yuan, 2000). Most geologists who have studied the clays agree that the ultimate source is the igneous and metamorphic basement of the Piedmont and Appalachian provinces, because: (1) the surrounding sediments originated in the Piedmont and Appalachian provinces, (2) kaolinite minerals are a common diagenetic product of those rocks, and (3) the historical gradient would have caused the transport of rocks from the Piedmont and Appalachians to the Coastal Plain. Yuan (2000) noted that clays and micas of Piedmont rocks show similar K-Ar ages to the commercial clays. However, other precursors have been considered. Buie (1964) argued for a volcanic origin of the clays, although recent studies indicate this to be unlikely because the

physical properties of the clay particles are unlike those forming from volcanic ash. Dombrowski (1993) speculated that different types of crystalline rocks caused the different types of clay; with hard clay originating from phyllite and soft clay from granite or gneiss. He noted a physical correlation between specific source rocks (e.g., the Sparta Granite) and kaolin-rich sedimentary rocks of the Buffalo Creek Formation.

The original depositional environments are important because most geologists believe that hard and soft clays were formed in different settings. The soft clays lenses are thought to be the top of fining up deltaic sequences, far enough updip to be in freshwater conditions. They contain few sedimentary features, no body or trace fossils, and no distinctively marine sediments such as lime, gypsum, or manganese nodules, although the lack of these features is sometimes attributed to diagenesis. But the consensus remains for freshwater deposition:

This non-marine environment is indicated by the presence of upland pollen grains and spores, large logs and stumps, and abundant terrestrial plant cuticle and woody fibers (Pickering et al., 2003, pp. 73–74).

Hard clays are thought to have been deposited in transitional to near-shore marine conditions similar to the modern coastal setting in Georgia. That interpretation is supported by the geometry of the clays, the lithology of the surrounding sediments, and the presence of marine trace fossils, microfossils, and bioturbated zones. Possible environments include intertidal salt marshes (Horstmann, 1983), brackish or shallow marine (Schroeder, 1979), tidal flats (Patterson and Murray, 1984), and the neritic zone (Hurst and Pickering, 1997). Note the rather broad marine setting in clays above the “freshwater” soft clays (see Appendix).

Of course, the most fundamental question is why the clays are so pure.

Most geologists believe that the primary cause of that purity is diagenetic. Up until recently, that scenario emphasized the chemical effects of long ages of subarid tropical weathering, or “laterization.” But recent emphasis on groundwater and the role of bacteria in the subsurface have driven new theories of diagenesis by both chemical and bacterial interactions between groundwater and clay bodies (Hurst and Pickering, 1997). Groundwater circulation and bacterial activity lead to the oxidation of iron, destruction of organics, recrystallization of clay minerals, weathering of remaining feldspar and mica to kaolinite, alteration of titanium minerals to Anatase, and conversion of biogenic silica to opal-CT and quartz. The importance of groundwater is emphasized by Yuan (2000), who noted that kaolin purity seems related to the presence or absence of the overlying Twiggs Clay—a permeability barrier restricting groundwater recharge down to the kaolin lenses. The importance of groundwater seems indicated by the occurrence of pisolitic or bauxitic kaolins on top of some commercial clay lenses, the upward transition from reducing to oxidizing conditions in the clays, the more oxidized condition of updip clays, and the presence of etched and corroded quartz grains that support leaching:

Original sediment color was quite dark due to its abundant decomposing plant material.... Reducing conditions led to recrystallization of iron as pyrite/marcasite.... Intense post-depositional alteration, but by ground water oxidative weathering and microbial action, has removed most of the dark organic matter and altered pyrite to hematite and goethite. This alteration process has also resulted in considerable recrystallization in the older, soft, coarse kaolin, which was likely mediated by carbonic and sulfuric acids released during alteration of the organic matter and pyrite (Pickering et al., 2003, pp. 73, 74).

However, the level of diagenetic activity seems to be more severe in the soft clays than the hard clays, which is the opposite of what might be expected if groundwater diagenesis was the primary purification agent. Tertiary clays, which would be more accessible to groundwater action for many millions of years, show preservation of sedimentary features, a similar mineralogy to that of modern marshes, abundant gray (unoxidized) clay, and well-preserved sequence from sand to micaceous kaolin to clay.

Yuan dismissed the idea that the upper hard clay formed from the reworking or redeposition of the soft clay, although that idea was advocated for Brazilian clays by Sousa et al. (2006). Yuan (2000) argued that reworking was impossible because the lower soft clay is purer and more extensively recrystallized than the upper hard clay. However, this assumes that the lower clay was not diagenetically affected after the deposition of the upper clay, and that the upper clay was not altered during the redeposition process. Yuan (2000) admitted that the soft clays may have contributed in small part to the upper clay because sedimentary clasts of the lower clay are found above the Cretaceous unconformity.

In summary, Yuan (2000) described the following sequence:

1. Updip crystalline rocks weather (aided by bacteria) over long periods of time to saprolite.
2. Saprolite is eroded and transported by high-energy streams to Coastal Plain deltas during the Late Cretaceous.
3. Clay minerals accumulate in organic rich marshes by flocculation in ponds and lagoons on the delta. Decaying organic material creates anoxic conditions, which result in pyrite and anaerobic bacteria.
4. Sea level falls, leading to subaerial weathering, erosion, unconformity surfaces, and pervasive paleosol horizons. Kaolinite

recrystallization begins and bioturbation is intense, especially in upper kaolins. Aerobic bacterial action contributes to leaching of Na, Ca, and K from feldspar and mica, creating more kaolinite. Pyrite oxidizes to hematite and goethite.

5. The above sequence is repeated during Eocene sea level changes, but the clays are deposited in a marine, rather than freshwater, setting.
6. Sea level rises in the Late Eocene, resulting in the deposition of the Clinchfield Sand and Twiggs Clay, sealing lower kaolins from groundwater recharge. Bacterial action consumes most of organics.
7. Subsequent erosion breaches the Twiggs Clay and leads to the recharge of oxygenated groundwater "to saturate the clay lenses" (Yuan, 2000, p. 44). There, organics are removed and recrystallization of kaolinite minerals starts. Also, muscovite is altered to very coarse vermicular kaolinite and pyrite is again oxidized.

Critique of Uniformitarian Theories

There are several weaknesses to the uniformitarian theories. On a conceptual level, it is clear that the assumptions of deep time and past depositional environments similar to modern settings are not part of Earth's history. One of the key weaknesses is that these theories do not explain the geographic uniqueness of the kaolin belt in east-central Georgia. This point cannot be over emphasized but is often ignored. Current models posit conditions that would have existed in many other places near the Fall Line. Anywhere crystalline rocks were weathered, rivers were carrying the resulting clay to the Coastal Plain, and sea level changes created

transitional environments for both the accumulation and purification of clay, pure kaolin lenses should have formed. The real mystery is why east-central Georgia contains large accumulations of virtually pure clay relative to the rest of the Coastal Plain.

Second, there are a number of inconsistencies in the uniformitarian framework. The Marion Member of the Huber Formation has only one clearly identifiable fining upward sequence. Surely during millions of years of deltaic deposition, more than one fining upwards sequence would have been deposited. This is especially puzzling when we realize that the vast modern Mississippi delta formed in just a few thousand years. Perhaps the Marion Member sequence is a single hydraulic event and was deposited rapidly. And the Marion Member is not unique. Several other key stratigraphic units—each spanning millions of years—contain very few sequences.

It is interesting that the inferred Campanian (Cretaceous) and Ypresian (Eocene) highstands produced terrestrial commercial kaolin deposits, while the Priabonian (Eocene) highstand produced a marine smectite—the Twiggs Clay. This is especially surprising given that the latter highstand was 164–328 ft (50–100 m) lower than earlier highstands (Pickering et al., 2000, their figure 1.2). This curiosity is noted, but not explained:

Locally in Georgia, the Late Eocene was also a major highstand, but accompanied by marine smectite clays (Twiggs Clay) rather than fluvial to marginal marine kaolin (Pickering et al., 2000, p. 16).

Why did higher sea levels produce non-marine kaolinite and lower sea levels produce a marine smectite?

Geologists consider kaolin purity is a function of oxidation and winnowing during lowstands:

Lowstands would have led to erosion and unconformities, but would

also have exposed large areas of new coastal plain to weathering and leaching by groundwater; this during an interval of geologic time when greenhouse climates prevailed (Pickering et al., 2000, p. 16).

Why was this not also true for the younger Twiggs Clay? Millions of years of weathering and leaching should have altered the smectite in the Twiggs Clay. Purification during lowstands also presents problems for the kaolins. The same lowstands that supposedly “cleaned up” the kaolin should have created thick soil horizons and plant growth on top of the clay deposits that would have contaminated the exposed clays. Additionally, millions of years would have created a well-established drainage system that would have been transporting organics and the less pure clay of the Piedmont and mixing both with the kaolin, further decreasing clay purity.

In the same vein, it is interesting that the stratigraphically higher hard clays are not as dramatically altered as the lower soft clays. After all, they are closer to the surface, should have been exposed to more than 20,000,000 years of groundwater and microbial action; and would have been exposed to a similar climate for weathering, winnowing, etc. as the soft clays (since the setting has remained unchanged for 100 million years). Observation of the natural world suggests that the preservation of any pure mineral deposit is the product of unusual conditions, and common sense suggests that such preservation must be rapid to avoid dilution—a more common process than concentration. Timing is also a factor with regard to the role of the Twiggs Clay. The absence of the Twiggs Clay appears to correspond to the oxidation of kaolin bodies in stratigraphically lower units. However, the Twiggs clay was supposedly absent for 60,000,000 years, with kaolin buried in a shallow sedimentary environment near the recharge zone. The time prior to the Twiggs Clay should have been sufficient to create

well-oxidized sediments throughout the entire recharge zone.

Finally, concepts explaining the origin of lateritic or bauxitic soils by long periods of weathering have many problems. Despite claims that these soils require up to a million years to form, modern examples demonstrate otherwise (Froede, 2007; Klevberg and Bandy, in press). The primary mechanism of “laterization,” leaching by infiltration, has been shown to be less of a factor than groundwater action. Even uniformitarian geologists now trumpet the role of groundwater and bacteria in clay diagenesis, and admit that the process can occur rapidly. Hurst and Pickering (1997, p. 283) noted:

In permeable layers or zones, however, where conditions were oxic and groundwater contained chelating organics or H_2SO_4 (from bacterially mediated oxidation of sulfides), the rate of weathering was high, and could accomplish strong kaolinization in a few thousand years.

Thus, parameters other than deep time could have contributed to a relatively rapid chemical purification of the Georgia kaolins.

The kaolin of east-central Georgia is thought to have originated from the alteration of updip igneous and metamorphic rocks to saprolite, the transport and deposition of kaolinite muds, and their subsequent diagenesis. This is not inconsistent with the Flood, once issues of timing are resolved. The problem is not so much the formation of kaolinite minerals in sufficient bulk quantity, but their concentration and preservation as nearly pure lenses. That problem is doubled by the occurrence of two distinct types of commercial clay (hard vs. soft), and their apparent stratigraphic separation (Figure 4). As noted, geologists (e.g., Yuan, 2000) do not believe that the upper kaolin was derived from the lower in Georgia, but Brazilian geologists believe that the analogous Capim River deposits are genetically

related (Rossetti and dos Santos, 2006). Furthermore, the distinctions between the two types of clay may not be as clear cut as first thought:

Attempts to substitute the term Cretaceous kaolin for soft kaolin and the term Tertiary kaolin for hard kaolin have not been very successful because occasional Tertiary kaolins have soft kaolin textures and unusual Cretaceous kaolins have somewhat hard textures.... Austin (1998) also noted that Tertiary kaolin clays in Georgia could be as coarse as 50% finer than two microns, which would be coarser than many of the typical Cretaceous kaolins (Yuan, 2000, p. 37).

Another problem that uniformitarians face is the difficulty of deriving a clear stratigraphic succession in the area. In the upper Coastal Plain, classification and correlation are based primarily on lithology. Because lithology is a function of environment and source as well as time, correlation may or may not follow time lines. For example, the Pio Nono Formation was excluded from the Oconee Group because it contains no commercial grade clay. But is that relationship one of lateral facies variation? Geologists support their contention by claiming that the Pio Nono is separated from Oconee sediments by an unconformity, but by their own admission it is “subtle.” The problem is not unique to the Pio Nono and Oconee Group sediments. Other stratigraphic units could very easily be distinct facies of similar age. Correlation is quite difficult. Figure 7 illustrates the variation between the stratigraphy of the kaolin belt and that from just the other side of the South Carolina border. In both areas, there are abundant well and core data. But even so, the stratigraphic complexity may be largely artificial. As the early stratigraphers noted, the bulk of the sediments consist of fining upward cycles of gravel, sand, silt, and clay; some capped by kaolin lenses, and others not.

Geologists expecting to see the remains of millions of years of deposition may see complexity of a time-based system, rather than the simplicity of a hydraulic and environmental one. For example, they note that unconformities are crucial in their allostratigraphic approach, yet are the “regional” unconformities really regional and do they represent long periods of time? Often, it appears not:

The boundary with the overlying Jeffersonville Member is a “subtle unconformity and not easily distinguished” (Pickering et al., 2000, p. 11).

Finally, there is a geomorphological reason to doubt the proposed uniformitarian history. Landscapes are not stable, and for any region to remain basically unchanged for 100 million years stretches credulity, given modern erosional rates or even plate tectonic cycles. This is even more true given the subtropical climate of the area.

A Diluvial Setting

At this time, we cannot offer a complete diluvial model for the formation of soft or hard kaolin clay minerals, but we do propose a number of constraints that any such model must consider. Before any specific diluvial interpretation can be attempted, the bounding assumptions must be revised. These include, of course, the time available for clay formation and the probability of depositional conditions much different from the low-energy paleoenvironments posited by uniformitarians. Because the uniformitarian model depends on millions of years of groundwater and bacterial polishing of very low permeability clays, the major challenge for a diluvial explanation is to find other mechanisms to explain clay purity or to show that the same mechanisms operating over thousands of years could yield the requisite purity.

What are the bounding parameters for a diluvial model? First, we must set the context in terms of the Flood

stage. The Coastal Plain sediments as a whole consist of a massive and continuous blanket from the Northeast around the Atlantic and Gulf coasts, where many thousands of feet of sediment accumulated to form the present day continental slope, shelf, and exposed coastal plains. As a whole, these sediments and their subsequent modification by erosion probably resulted from receding floodwaters. However, the variety of facies suggests rapid changes in sea level and lateral hydraulic variation. The late-Flood interpretation is also supported by the unconsolidated nature of the sediments and the dip-oriented interfingering of marine and freshwater facies throughout the vertical record. Therefore, we conclude that the kaolin was probably deposited late in the Flood. The updip, near surface location of the clays also means that they would have been subject to physical and chemical groundwater fluctuations expected from the Flood recession up to the present, although clearly there was not time for the extended exposure of the clay surfaces to weathering and winnowing posited by uniformitarian workers.

The distribution of marine and terrestrial sediments within the Coastal Plain demonstrates sea level fluctuations during their deposition. Once marine waters had permanently withdrawn from the upper Coastal Plain, the adjustment of climatic conditions to post-Flood weather patterns would have resulted in higher precipitation and more rapid groundwater influx for a period of time as the new hydrologic system was being established. This elevated precipitation/recharge condition would have lasted for several centuries after the Flood, due to climatic changes brought about by the Ice Age. The re-establishment of vegetation and fluvial drainage systems would also have affected the groundwater system. Groundwater chemistry would have also been affected by global late to post-Flood volcanism which would have generated a significant amount of acid

rain. Variations in bacterial concentrations in both sediments and groundwater may also have been affected. In any case, early diagenetic processes would have been accelerated by acidic and oxic conditions quite different from the present day. Although evidence does not support a direct volcanic precursor for the kaolins, the overlying Twiggs clay—a siliceous smectite—probably did result in part from volcanic ash, and it is not entirely unreasonable to suspect that part of the kaolin deposits did, too.

Another element bounding a diluvial explanation would have been tectonic instability. Uniformitarians date nearby basement rift basins as “Triassic” and assume they were quiescent by Late Cretaceous time, but in the diluvial paradigm, the rifting occurred immediately prior to Coastal Plain sediment deposition. These rift basins occur throughout the Coastal Plain, from Canada to South Georgia (Schlische, 1993). In Georgia, the Gulf Trough/Suwannee Strait exhibit tectonism synchronous with Coastal Plain sedimentation. Just to the east, the upper Coastal Plain sediments overlie the sedimentary fill of the Dunbarton Basin. Updip, the Piedmont Province exhibits evidence of widespread igneous and tectonic activity during the Flood. These factors may have contributed to elevated levels of hydrothermal activity, including the migration of hydrothermal solutions up from basement rocks into the newly deposited overlying sediments. Furthermore, this activity may also have accelerated the formation of clay minerals in the Piedmont Province. The association of kaolin lenses and carbonate karst in northwest Georgia and with bauxite in the western Coastal Plain certainly suggests hydrothermal influences (Silvestru, 2003).

It may well be that saprolite from the Piedmont Province was the precursor of the commercial kaolin clay, but saprolite does not require long periods of in situ weathering to form, given the proper chemical environment. However, it

may also be true that the kaolin and the saprolite are both manifestations of the same geochemical processes occurring at the same time. It is interesting that the mineralogy of most of the Cretaceous updip sediments in east-central Georgia consists of physically immature quartz sand with a kaolin matrix. Perhaps these sands are the diagenetic products of arkosic sands, like the Pio Nono Formation, with the feldspar strongly altered to kaolinite by acidic, oxygenated pore fluids.

Although kaolin is quite common in many sedimentary rocks, it is relatively rare in commercial accumulations, especially when found as an apparent sedimentary deposit. Although exact mechanisms for deposition and preservation are elusive, one fact stands out quite clearly: it is much easier to emplace a lens of pure kaolin rapidly than to do so slowly. In the Coastal Plain, there was an abundant supply of terrigenous gravel, sand, silt, organic material, fossils, and other “impurities.” The unusual conditions required to deposit a pure kaolin lens would not be expected to last. Thus, while uniformitarian theories focus on how to refine an organic-rich kaolin deposit following deposition, they ignore contamination that would have been occurring simultaneously, caused by the same factors they propose would create pure clay. Also, evidence of high-energy erosion and redeposition of kaolin bodies must have happened quickly; otherwise the redeposited kaolin clasts would have been disaggregated. The greatest failure of their theories is that many deposits of commercial kaolin along the Atlantic and Gulf Coastal plains should be present, given uniformitarian conditions.

The diluvial paradigm raises several new avenues of research regarding the origin of the clays. These can be summarized in the following questions:

1. Can localized clay purity be explained by local, ephemeral geochemical environments?

2. Could clay “polishing” occur during rapid dewatering of acidic, oxygenated pore fluids during clay compaction rather than over millions of years by slow infiltration by less acidic and less oxygenated groundwater?
3. If the soft kaolin is the result of a very rare combination of sedimentary, chemical, and preservation factors, then is it not reasonable to re-evaluate the genetic relationship between the soft and hard kaolin?

Related questions regarding depositional environments and the timing of the emplacement of the Coastal Plain should also be addressed.

Although at present many geologists reject the hard clays as reworked deposits of soft clay, that possibility should not be rejected. Uniformitarians see the current clay lenses as being approximately the same size and shape as when they were originally deposited. But it is certainly possible that the initial clay deposits were more widespread, and that their current configuration reflects their preservation as much as their original state. If nothing else, deriving the hard clay from pre-existing kaolin saves explaining how the same very unusual depositional/diagenetic processes happened twice—a problem for either paradigm.

Differences between the hard and soft clays are as easily explained in the diluvial paradigm as in the uniformitarian. The absence of fossils, with the rare exceptions of large plant remains (i.e., stumps) in the lower clays would fit their rapid deposition as floodwaters receded—further evidence that they formed in an unusual setting. The presence of fossils in the upper clays is also consistent with a sedimentary origin in the retreating, fluctuating marine waters of the Flood via reworking of soft kaolin. The presence of marine waters at the Fall Line suggests a late Flood rather than a post-Flood setting.

Conclusion

The kaolins of east-central Georgia are unique deposits; not simply in their commercial purity, but also in their origin and history. Uniformitarian explanations focus on modern processes operating over tens of millions of years. But their greatest weaknesses are that these processes should have produced ubiquitous impure kaolin deposits along much of the Fall Line. Like many other unusual features of the rock record, a close examination of the data indicates that the standard uniformitarian scenarios cannot explain the actual phenomena in a consistent manner. Many aspects of the Coastal Plain sediments are better explained by rapid, unique erosional and depositional processes rather than 100 million years of uniformitarian stasis. Like many other phenomenon that present mysteries for uniformitarian geology, a change in paradigms may shed light on the origin of these unusual deposits. Rapid hydraulic and geochemical processes may facilitate explanation, and this cursory examination of the upper Coastal Plain suggests that to be the case. Growing knowledge of the Georgia kaolins will reveal clues to their rapid emplacement and their unusual purity, and we predict that superior models and mechanisms will be found in the diluvial paradigm.

Appendix

Uniformitarian clay mineralogists have defined all of the various clay minerals into formal clay groups based on their atomic structure and charge (Chamley, 1989). While uniformitarian geoscientists recognize that clays can diagenetically alter to other clay mineral groups following burial, they have also used them to recreate paleofacies, which requires the assumption that one type of clay has not subsequently been changed into another. The kaolin clays have historically been identified as indicative of freshwater deposition, although they can

and do occur in marine settings (often defined as a shallow setting and usually in association with an active fluvial setting). Furthermore, kaolin can form from the chemical alteration of marine clays, such as smectite. The “freshwater” interpretation of Georgia kaolins depends on the absence of marine fossils, but that might not be a reliable indicator if these clays were eroded, transported, and deposited during the Flood. This is another example of uniformitarian assumptions that are often hidden beneath the surface; taken for granted by most geologists, but inappropriate for diluvial studies. Clay minerals can (and likely have) diagenetically altered following burial. We need to consider the conditions expected during the Flood framework and seek to resolve the kaolin question from that perspective.

References

- Buie, B.F. 1964. Possibility of volcanic origin of the Cretaceous sedimentary kaolin of South Carolina and Georgia. In Bailey, W.F. (editor). *Clays and Clay Minerals*, Proceedings of the 12th National Conference, Macmillan, New York, NY.
- Buie, B.F. and R.C. Fountain. 1967. *Tertiary and Cretaceous Age of kaolin deposits in Georgia and South Carolina*, p. 19. Geological Society of America, Southeastern Section Annual Meeting.
- Chamley, H. 1989. *Clay Sedimentology*. Springer-Verlag New York, NY.
- Chen, P.-Y., M.-L. Lin, and Z. Zheng. 1997. On the origin of the name kaolin and the kaolin deposits of the Kauling and Dazhou areas, Kiangsi, China. *Applied Clay Science* 12(1–2):1–25.
- Clark, O.M. 1992. Eufaula Bauxite District, Alabama-Origin, Exploration, and Mining Problems. In Rheams, K.F., and G.H. McClellan (editors). *Industrial Minerals of the Southeastern United States – Proceedings of the 2nd Annual Symposium on Industrial Minerals*, pp. 9–15. Circular 161, Geological Survey of Alabama, Tuscaloosa, AL.
- Cravero, F., E. Dominguez, and C. Iglesias. 2001. Genesis and applications of the Cerro Rubio kaolin deposit, Patagonia (Argentina). *Applied Clay Science* 18(3–4):157–172.
- Dombrowski, T. 1993. Theories of origin for the Georgia kaolins. In Murray, H.H., W. Bundy, and C. Harvey (editors). *Kaolin Genesis and Utilization*, pp. 75–98. Clay Minerals Society, Boulder, CO.
- Fentaw, H.M. and T. Mengistu. 1998. Comparison of Kombelcha and Bombowha kaolins of Ethiopia. *Applied Clay Science* 13(2):149–164.
- Froede, C.R., Jr. 1997. The Flood Event/Ice Age stratigraphic boundary on the United States southeastern Coastal Plain. *Creation Research Society Quarterly* 34:75–83.
- Froede, C.R., Jr. 2007. *Geology by Design: Interpreting the Rocks and Their Catastrophic Origin*. Master Books, Green Forest, AR.
- Harris, R.S. 2003. Re-evaluating the origin of an Upper Eocene diamictite in the Coastal Plain of east-central Georgia: an impactoclastic layer? Lunar and Planetary Science XXXIV (1965 pdf). <http://www.lpi.usra.edu/meetings/lpsc2003/pdf/1965.pdf> (accessed 2/2007).
- Hetrick, J.H. and M.S. Fridell. 1990. *A Geologic Atlas of the Central Georgia Kaolin District*. Georgia Department of Natural Resources Geologic Atlas 6, Atlanta, GA.
- Horstmann, K.M. 1983. *Estuarine-tidal flat depositional model for the Paleocene-Eocene Huber Formation, East-Central Georgia*. Masters Thesis. Duke University, (Address?).
- Huddlestun, P.F. and J.H. Hetrick. 1991. *The Stratigraphic Framework of the Fort Valley Plateau and the Central Georgia kaolin district*. 26th Annual Georgia Geological Society Guidebook 11(1).
- Hurst, V.J. and S.M. Pickering. 1997. Origin and classification of Coastal Plain kaolins, southeastern USA, and the role of groundwater and microbial action. *Clays and Clay Minerals* 45(2):274–285.
- Klevberg, P. and R. Bandy. In Press. The problem of soils. In Oard, M.J. and J.K. Reed (editors). *Rock Solid Answers: Responses to Popular Objections to Biblical Geology*. Master Books, Green Forest, AR.
- Kogel, J.E. 2000. Kaolin mineralogy: Key to Resource quality, process response, and product development. In Kogel, J.E., S.M. Pickering, Jr. E. Shelobolina, J. Yuan, and T.M. Chowns. *Geology of the commercial kaolin mining district of central and eastern Georgia*, pp. 17–36. Georgia Geological Society Guidebook 20(1), Atlanta, GA.
- Kogel, J.E., S.M. Pickering, Jr. E. Shelobolina, J. Yuan, and T.M. Chowns. 2000. *Geology of the Commercial Kaolin Mining District of Central and Eastern Georgia*. Georgia Geological Society Guidebook 20(1), Atlanta, GA.
- Patterson, S.H. and H.H. Murray. 1984. Kaolin, refractory clay, ball clay, and halloysite in North America, Hawaii, and the Caribbean region. USGS Professional Paper 1306, Washington, D.C.
- Pickering, S.M., Jr. and V.J. Hurst. 1989. *Commercial Kaolins in Georgia, Occurrence, Mineralogy, and Use*. Geological Society of America, Southeastern Section Guidebook 3.
- Pickering, S.M., Jr., T.M. Chowns, and D.M. Avant, Jr. 2000. Kaolin stratigraphy and its use in exploration. In Kogel, J.E., S.M. Pickering, Jr. E. Shelobolina, J. Yuan, and T.M. Chowns (editors). *Geology of the Commercial Kaolin Mining District of Central and Eastern Georgia*, pp. 3–16. Georgia Geological Society Guidebook 20(1), Atlanta, GA.
- Pickering, S.M., A.M. Elser, E. Shelobolina, J.R. Anderson, Jr., and D.M. Avant, Jr. 2003. Minerals in transition: examples of intensive weathering in the kaolin mining district of Central Georgia. In Elliot, W.C. (editor). *Classic Clays and Minerals*, pp. 68–84. Field Guide from a joint meeting of the Clay Minerals Society and the Mineralogical Society of America, Athens, GA.
- Rossetti, D. and A.E. de Araujo dos Santos, Jr. 2006. Analysing the origin of the Upper

- Cretaceous-? Lower Tertiary Rio Capim semi flint (Para State, Brazil) under a sedimentologic perspective. *Sedimentary Geology* 186(1-2):133-144.
- Schlische, R.W. 1993. Anatomy and evolution of the Triassic-Jurassic continental rift system, Eastern North America. *Tectonics* 12(4):1026-1042.
- Schroeder, C.H. 1979. *Trace fossils of the Upper Cretaceous-Lower Tertiary and Basal Jackson Group, east-central Georgia*. Masters Thesis, University of Georgia at Athens, Athens, GA.
- Shelobolina, E. 2000. Role of Microorganisms in Development of Commercial Grade Kaolins. In Kogel, J.E., S.M. Pickering, Jr. E. Shelobolina, J. Yuan, and T.M. Chowns (editors). *Geology of the Commercial Kaolin Mining District of Central and Eastern Georgia*, pp. 45-56. Georgia Geological Society Guidebook 20(1), Atlanta, GA.
- Silvestru, E. 2003. A hydrothermal model of rapid post-Flood karsting. In Walsh, R.E. (editor). *Proceedings of the Fifth International Conference on Creationism*, pp. 233-239. Creation Science Fellowship, Pittsburgh PA.
- Sousa, D.J.L., A.F.D.C. Varajao, and J. Yvon. 2006. Geochemical evolution of the Capim River kaolin, Northern Brazil. *Journal of Geochemical Exploration* 88(1-3):329-331.
- Yuan, J. 2000. Origin of the Georgia-South Carolina Commercial Kaolins. In Kogel, J.E., S.M. Pickering, Jr. E. Shelobolina, J. Yuan, and T.M. Chowns (editors). *Geology of the Commercial Kaolin Mining District of Central and Eastern Georgia*, pp. 37-44. Georgia Geological Society Guidebook 20(1), Atlanta, GA.



Book Review

Pioneer Explorers of Intelligent Design: Scientists Who Made a Difference

by Don B. DeYoung

BMH Books, Winona Lake, IN, 2006, 128 pages, \$13.00.

This is the latest book by prolific author Don DeYoung. It is not that the book represents the plowing of new ground, but at present it is the broadest survey yet of a particular landscape—namely deceased authors important in the history of science along with their religious orientations. DeYoung stresses that “The entire foundation of modern science and technology was laid down by men and women of faith” in a “biblical worldview” (p. xiii).

In my office on the bookshelf are eight other books dealing with comparable topics; however, DeYoung’s book has a broader coverage than any other. This coverage includes many Protestants and Catholics, along with Jews and even the Deist Benjamin Franklin.

Dr. John C. Whitcomb writes a brief but excellent foreword in which

he describes this pioneer book as “an illuminating and encouraging ‘Hebrews 11 Hall of Fame’ for creation science. These 144 major contributors to scientific discovery during the past 500 years believed in the God of creation and the biblical record of His mighty works” (p. xi).

The table of contents includes a complete 7-chapter list of the pioneer explorers according to their special fields of interest (astronomy, mathematics, medicine, etc.). Chapter 8 sadly has 16 names of “Missing Persons” from the list of creationist pioneers, including Isaac Asimov, Charles Darwin, and Carl Sagan. There is an alphabetical name index of all the above.

This “Pioneer” publication also has an introduction, conclusion, references, and Scripture index. Many small photos

and drawings adorn the pages. An appendix contains an alphabetical list of 106 additional people (Faraday, Newton, Linnaeus, etc.) discussed in Dr. Henry Morris’s earlier compilation, *Men of Science—Men of God* (1982).

All of us concerned about the history and impact of science should have DeYoung’s book available for reference, as well as to present as a gift to budding scientists.

Reference

- Morris, Henry. 1982. *Men of Science—Men of God*. Master Books, Green Forest, AR.

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Was the Prostate Gland Poorly Designed?

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Abstract

The common claim that the prostate is poorly designed is reviewed, and it is concluded that many very good reasons exist for its design and placement around the urethra. The main prostate problem, benign prostatic hypertrophy, is caused by disease, hormone imbalance, and other health problems, not poor design.

Introduction

Enlargement of the prostate, a condition called *benign prostatic hypertrophy* (BPH), or *benign prostatic hyperplasia*, occurs in approximately half of all men by age 60. The most common result of BPH is blockage of urine flow in males. This problem is widely touted by Darwinists as proof of poor design and evidence that humans were not designed but rather evolved by natural selection of random mutations.

The Prostate Gland

The prostate in an average adult male is a walnut-shaped gland four cm long by two cm wide and weighing about 20 grams. Found only in males, it is small at birth, enlarges rapidly at puberty, and sometimes shrinks in octogenarians. Located directly below the bladder, it surrounds the urethra where the urethra exits the bladder (see Figure 1). The prostate gland itself is a complex

fibromuscular structure that contains a conglomerate of 30 to 50 small saccular glands. The entire prostate is divided into two main lobes and is totally enclosed in a tough fibrous capsule (Garnick, 1996, p. 27). The proximal section connected to the bladder is called the base, the opposite end, the narrow distal part, the apex. The main divisions of the prostate are the central region, the transitional (inner) region, which surrounds the urethra, and the peripheral, or outer layer (Naz, 1997). For a diagram of its internal structure, see Figures 2 and 3.

Among the prostate's several functions, one is to produce the secretions that constitute much of the volume of the seminal fluid (Swanson and Forrest, 1984). The prostate is called a complex semen factory; and its secretions consist of a thin, opalescent liquid that contains a soup of complex compounds, including citric acid, phosphatase, prostaglandin (named after the prostate gland because it was first discovered there),

diastase, fructose, beta glucuronidase, a potent fibrinolysin, spermine, and several proteolytic enzymes (Bloom and Fawcett, 1969). Semen contains mucus, which has an alkaline pH of 7 to 8 and serves to neutralize the acidic male urethra and female reproductive tract to allow sperm to survive their trip from the testicles to the uterine (fallopian) tubes.

The Poor Design Argument

A common dysteleological claim is that the human prostate gland is poorly designed because it surrounds the urethra, a thin tube resembling a miniature straw that carries urine from the bladder to exit the body (Garnick, 1996, p. 26). An example of this poor-design argument is the following claim:

In human males, the urethra passes right through the prostate gland, a gland very prone to infection and subsequent enlargement. This blocks the urethra and is a very common medical problem in males. Putting a collapsible tube through an organ that is very likely to expand and block flow in this tube is not good design. Any moron with half a brain (or less) could design

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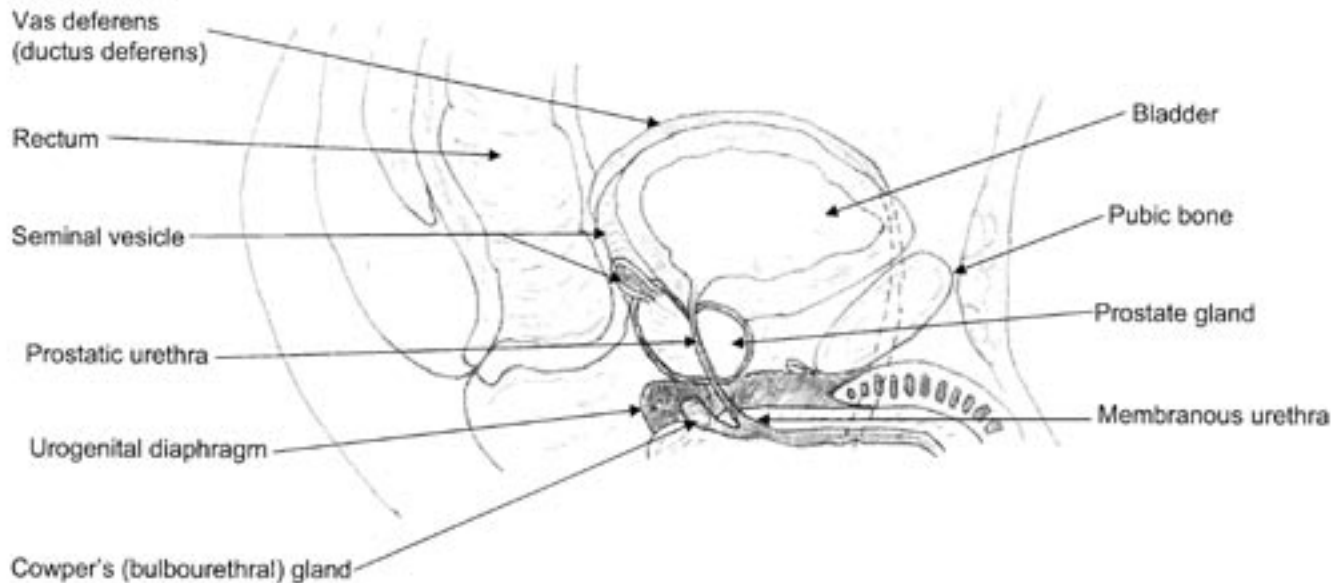


Figure 1. Cross section of the male reproductive system showing the prostate located below the bladder, and the deferent duct (vas deferens), the tube along which sperm travels to the prostate, then to the urethra and out of the body. Also shown are the urogenital diaphragm, which supports the prostate and separates it from the structures below. Last, the seminal vesicle and bulbourethral (Cowpers) gland are seen, two other secretory organs that add their secretions to the semen. From Baggish, 1996. Drawn by B. L. Lindley-Anderson.

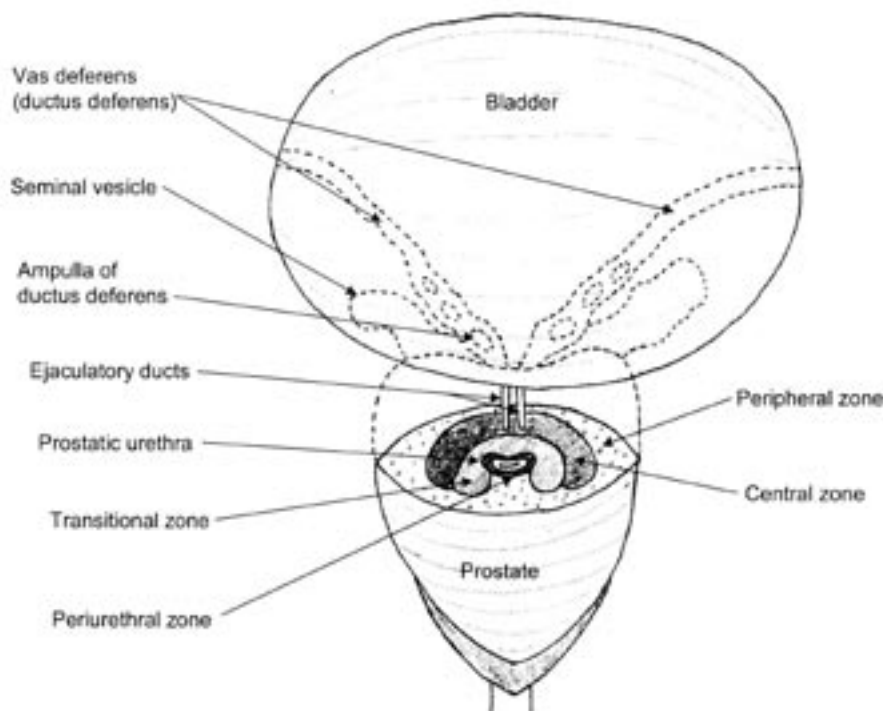


Figure 2. A cutaway of the prostate showing the internal structures. The four distinct zones shown are based on microscopic structural differences. All of these zones have differences based on anatomy and function. The two vas duct tubes and the two seminal vesicles are located behind the bladder and for this reason are shown as dotted lines. From Baggish, 1996. Drawn by B. L. Lindley-Anderson.

male plumbing better (Colby et al., 1993, p. 1).

University of Chicago Biologist Jerry Coyne wrote:

Why did God—sorry, the Intelligent Designer—give whales a vestigial pelvis, and the flightless kiwi bird tiny, nonfunctional wings? ... What a joker! And the Designer doesn't seem all that intelligent, either. He must have been asleep at the wheel when he designed our appendix, back, and prostate gland (Coyne, 2006 p. 1).

Professor Karen Bartelt wrote that if we assume, as intelligent design postulates, that

humans can discern design, then I submit that they can also discern poor design (we sue companies for this all the time!). In *Darwin's Black Box*, Behe refers to design as the purposeful arrangement of parts. What about when the parts aren't purposeful, by any standard engineering

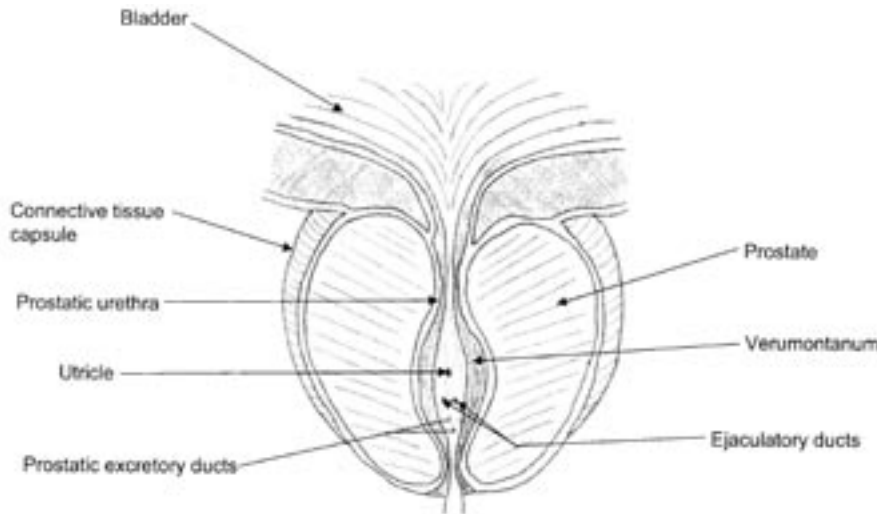


Figure 3. A cross section of the prostate gland showing the body of the gland, the connective capsule that protects it, and the ejaculatory ducts through which the sperm travel. The prostate secretions enter the urethra via the prostate excretory ducts. The verumontanum is an elevation, or crest, in the wall of the urethra where the seminal ducts enter. From Baggish, 1996. Drawn by B. L. Lindley-Anderson.

criteria? When confronted with the “All-Thumbs Designer,” whoever designed the spine, the birth canal, the prostate gland, the back of the throat, etc. Behe and the ID people retreat into theology (1999, p. 4).

The online encyclopedia Wikipedia (2006), under the heading “Argument from Poor Design, a Dysteleological Argument against the Existence of God,” listed as the first example of poor design the “urinary tract in the human male, especially the unnecessary passage of the urethra through the prostate gland. As the prostate almost always grows with age, it eventually compresses the urethra and often makes urination difficult or even impossible.” Contrary to anti-intelligent design proponents, this claim assumes that you *can* detect design in biological systems.

Evaluation of the Claim

It is true that when the prostate becomes diseased or enlarges as a man approaches

retirement age, it can interfere with urine flow. Also, when the prostate enlarges, it obstructs the bladder neck outflow tract, and interferes with the normal sphincter mechanisms so that bladder evacuation can become incomplete. This condition causes the patient to assume that he has emptied himself, but some urine always remains in the bladder. This results in the problem that requires a patient who has just passed urine to urinate again after only a very short time.

Urine flow blockage in males is usually caused by the enlargement of the prostate, the medical condition known as benign prostatic hypertrophy (BPH). Although enlargement occurs in about half of all men by age 60, the condition often can be treated with medication and in about 70% of all cases the enlargement is minor (rated less than moderate), and the number of moderate to severe cases increases with age (Naz, 1997, p. 9).

One study found only 25 to 30 percent of men in the 70 to 74 age range

had clinical BPH (Naz, 1997, p. 10). Furthermore Naz found that the prostate is not likely to expand or enlarge because of poor design, but rather it usually enlarges as a result of poor health, bacterial or viral infection, or other diseases, genetic mutations, hormonal imbalance, race or ethnicity influences, poor diet, smoking, sexual habits, obesity, use of certain medications, excess androgen production, lack of testosterone regulation, or cancer (Naz, 1997).

For this reason, blockage is not the result of poor design but rather is a clear early indication that something is wrong (such as BPH or prostate cancer), and that the affected person should consult a physician to determine the cause. It is for this reason that changes in urine flow often trigger an examination that allows early detection of prostate cancer, usually by taking a Prostate Specific Antigen (PSA) test and by digital examination of the prostate. Thus, early systems of prostate problems can actually have the benefit of yielding a higher level of probability of successful treatment of more severe conditions (Foster and Bostwick, 1998). Cancer cells often originate in the posterior region of the prostate, hence early cancer can be felt as very hard nodules on rectal examination.

Causes of Benign Prostate Hypertrophy

The causes of BPH are not well understood. BPH occurs mainly in older men and does not develop in men who were castrated before puberty. For this reason, factors related to aging and the misregulation of hormones produced by the testes are believed to be major causes of BPH. Men produce both testosterone and small amounts of estrogen, a female hormone, throughout their lives. As men age, the amount of active testosterone in the blood decreases, leaving a higher proportion of estrogen (Snyder et al., 1999). Animal studies suggest that BPH may result from the higher amount of

estrogen within the gland and this condition increases the activity of cell growth promotion hormones.

Another cause focuses on dihydrotestosterone (DHT), which is a testosterone-derived substance that may help to regulate prostate growth. Most animals lose their ability to produce DHT as they age. Even with a decrease in blood testosterone level, some older men continue to produce high levels of DHT in the prostate. High levels of DHT and other hormones such as oxytocin may encourage abnormal cell division, causing BPH (Cook and Sheridan, 2000; Nicholson, 1996). Evidence for this conclusion includes the finding that men who do not produce excessive DHT levels do not develop BPH.

Research also suggests that BPH can develop due to instructions given to cells early in life. This theory concludes that BPH occurs because cells in one section of the gland reawaken later in life as a result of these instructions. These reawakened cells then deliver signals to other cells in the gland, either instructing them to grow or making them more sensitive to certain growth hormones.

Reasons for the Existing Urethra Designs

One reason for the existing design is the prostate serves both as a support for the bladder and a spacer between the bladder and the urogenital diaphragm. This allows the vas deferens and the seminal vesicles room to connect to the urethra. Because the urethra is a small, narrow tube without a substantial support system, the bladder, when full, would cause kinking of the urethra. One possible solution could be support of the bladder by ligaments to prevent its interfering with possible urethra outflow, but this would require a new support system, new attachment sites, and other structures. Economy allows the prostate to serve this role as well as the other roles noted in this paper.

Rather than the urethra going through the prostate, it is more accurate to describe the prostate as an expanded part of the urethral wall. Each of the distinct glandular regions of the prostate develops from a different segment of the prostatic urethra (see McNeal, 1998, p. 19). The fact that the prostate is part of the urethra is actually an example of intelligent design because this design allows the prostate to more rapidly deposit its secretions into the urethra, where they mix with the seminal vesicle secretions. The prostate's 30 to 50 glands secrete into 16 to 32 small excretory ducts that open independently into the urethra so that they rapidly transfer their products (Foster and Bostwick, 1998, p. 3). This rapid transfer is required in order for the system to operate effectively. The prostate's smooth muscle is a highly effective system to empty the tubules during the sexual response, thus forcing semen rapidly into the urethra. The tubules open on both the right and left sides of the colliculus seminalis, a U-shaped opening that runs along the urethra.

The entire prostate also contracts during the sexual response, in turn contracting the U-shaped urethra, thus forcing semen forward in the urethra. Because the many small cavernous holes all open directly into the U-shaped opening, prostate contraction helps to effectively propel the semen forward during the sexual response. It must travel out of the urethra with sufficient force to make its journey successfully in order to achieve fertilization. In the words of Baggish, the urethral capsule segment squeezes fluid out of the prostate during ejaculation (1996, p. 2).

The rhythmic contractions of the prostate propel the semen forward in the urethra during the first stage of the sexual response (Katchadourian, 1989, p. 71; deGroat and Booth, 1980; Dunsmuir, and Emberton, 1997). A one-way valve (the preprostatic sphincter) prevents retrograde flow of semen. This complex and intricate structure is very

similar in different mammalian species and is highly conserved, which is evidence that the system is well designed, highly effective, and functional (Foster and Bostwick, 1998).

Those claiming that the prostate is poorly designed must have a better alternate design in mind. The only other option is a separate prostate located to one side of the urethra. This would require a new duct system that would add a cumbersome set of structures and greatly slow the flow of semen into the urethra. This alternative design would require another structure to propel the semen into the urethra and yet another system to help propel the semen along the urethra to replace the several roles that the prostate now serves.

The Nerve Plexuses

The prostate also contains abundant nerve plexuses, mostly consisting of non-myelinated nerve fibers and sensory nerve endings. As noted, the prostate itself contracts during sexual excitement, and it is this contraction that produces much of the pleasure accompanying sexual activity due to the abundant nerve plexuses. Autonomic nerves arising from the hypogastric plexus contribute to the prostate plexus. The normal healthy prostate is, for this reason, a source of pleasure rather than of pain (see Morganstern and Abrahams, 1996, p. 4).

Other Functions of the Prostate

Another function of the prostate is to help control urine flow. A Cleveland clinic urologist report concluded that the "prostate gland, which surrounds the tube that allows urine to flow outside the body, also helps to hold back urine until the time to release (Shuman, 2006). When the prostate is removed, most men experience some degree of incontinence, usually lasting from three to six months, but sometimes lasting for the

rest of their lives (Dierich and Felecia, 2000). Post-prostatectomy incontinence levels can range from total to incontinence occurring only under certain conditions, such as in the stress incontinence condition. About 10 percent of all men experience extreme urinary incontinence after prostate surgery. This is often temporary, but may last for years (Newman and Dzurinko, 1997; Burgio et al., 1990). As Leach (2004, p. 1) notes, loss of bladder control after prostate surgery is a devastating complication that has a significant negative impact on quality of life.

The major cause of post-operation prostatectomy incontinence is disruption of the involuntary sphincter muscle at the bladder neck. This injury from the surgery can be permanent or temporary due to swelling, leaving only the voluntary lower sphincter. Lack of the prostate after surgery, though, also contributes to the problem. Because females lack a prostate to help control urine flow, some feel this is one of several reasons why women are much more likely to suffer from incontinence. Incontinence in women results mainly from sagging (prolapse) of the anterior vaginal wall initiated by the trauma and stretching due to childbirth labor. Harvard Medical School MD, Andrew Weil wrote concerning prostatectomy:

Surgical removal of the prostate gland is another expensive and painful operation, frequently resulting in impotence and urinary dysfunction. It is done as treatment of benign prostate hypertrophy (BPH) and early stages of prostate cancer. In the case of cancer, removal of the gland is often unnecessary if the cancer is not aggressive (Wallenchinsky and Wallace, 1993, p. 117).

Are Any Prostate Accessory Structures Vestigial?

As scientists study the prostate, they have learned that it is a complex, well-

designed structure with many accessory structures, all of which are important, and none of which are vestigial as once taught by Darwinists. This brief review can only outline some of the major structures and functions of the prostate itself. An example of one structure is the *utricle*. Once thought to be useless, it is now known to be an important accessory gland (Bloom and Fawcett, 1969, pp. 718–719).

Summary

Those claiming that the prostate is poorly designed usually show evidence of a shallow knowledge of its many functions. To prove their claim, they need to propose a better design that deals equally well with its many functions and requirements. Until then we must conclude that the prostate is well designed for its many roles. The problem is not poor design but infections, mutations, teratogens, degeneration of the genome, and unhealthy behavior.

Board specialist in pathology, Agatha Thrash, wrote that for all the prostate's lowly credentials, it is an amazing piece of engineering (Thrash, 2006, p. 1). The prostate's several functions include producing the conditions (such as the required pH) allowing sperm to survive their trip from the testicles to the fallopian tubes for fertilization. It serves all of these tasks remarkably well. After the childbearing years are past, the prostate can cause problems, but from a clinical standpoint, it is remarkably free of disease even during these later years. Only in the fifth or sixth decade of life does it cause problems, usually when long past its primarily reproductive function.

Acknowledgements

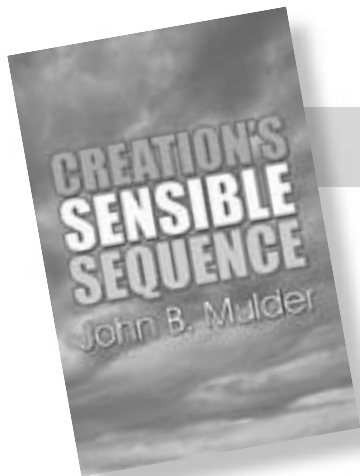
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References

- Baggish, J. 1996. *Making the Prostate Therapy Decision*. Lowell House, Los Angeles, CA.
- Bloom, W., and D. Fawcett. 1969. *A Textbook of Histology*. Saunders, Philadelphia, PA.
- Bartelt, K. 1999. A central Illinois scientist responds to the black box. *The Real News* 7:1, 4.
- Burgio, K. L., K. L. Pearce, and A. J. Lucco. 1990. *Staying Dry: A Practical Guide to Bladder Control*. The Johns Hopkins University Press, Baltimore, MD.
- Colby, C., and L. Petrich. 1993. Evidence for jury-rigged design in nature. *The Talk. Origins Archive*. <http://www.talkorigins.org/faqs/jury-rigged.html> (Accessed 9/15/07).
- Cook, T., and W. P. Sheridan. 2000. Development of GnRH antagonists for prostate cancer: new approaches to treatment. *The Oncologist* 5:162–168.
- Coyne, J. 2006. Ann Coulter and Charles Darwin. Coultergeist. *The New Republic Online*. July 31, 2006.
- deGroat, W.C., and A.M. Booth. 1980. Physiology of male sexual function. *Annals of Internal Medicine*. 92:329–331.
- Dierich, M., and F. Felecia. 2000. *Overcoming Incontinence*. Wiley, New York, NY.
- Dunsmuir, W., and M. Emberton. 1997. Surgery, drugs, and the male organism. *British Medical Journal* 314:319
- Foster, C.S., and D.G. Bostwick. 1998. *Pathology of the Prostate*. Saunders, Philadelphia, PA.
- Garnick, M.B. 1996. *The Patient's Guide to Prostate Cancer: An Expert's Successful Treatment Strategies and Options*. Penguin Books, New York, NY.
- Katchadourian, H. A. 1989. *Fundamentals of Human Sexuality*, 5th Edition. Holt, Rinehart, and Winston, New York, NY.
- Leach, G. 2004. Incontinence treatment options for post-prostatectomy. *Prostate*

- Cancer Research Institute Newsletter* 7(2)1–3.
- McNeal, J. 1998. Anatomy and normal histology of the human prostate. In Foster, C.S., and D.G. Bostwick (editors), *Pathology of the Prostate*, pp. 19–34. Saunders, Philadelphia, PA.
- Morganstern, S., and A. Abrahams. 1996. *The Prostate Sourcebook*. Updated edition. Lowell House, Los Angeles, CA.
- Naz, R. K. (editor). 1997. *Prostate: Basic and Clinical Aspects*. CRC Press, Boca Raton, FL.
- Newman, D.K., and M.K. Dzurinko, with foreword by Ananias C. Diokno. 1997. *The Urinary Incontinence Sourcebook*. Lowell House, Los Angeles, CA.
- Nicholson, H. D. 1996. Oxytocin: a paracrine regulator of prostatic function. *Reviews of Reproduction* 1:69–72.
- Shuman, T. 2006. *Prostate Cancer: Urinary Incontinence*. The Cleveland Clinic Report, Cleveland, OH.
- Snyder, P.J., H. Peachey, P. Hannoush, J.A. Berlin, L. Loh, D.A. Lenrow, J.H. Holmes, A. Dlewati, J. Santanna, and C.J. Rosen. 1999. Effect of testosterone treatment on body composition and muscle strength in men over 65. *Journal of Clinical Endocrinology and Metabolism* 84:2647–2653.
- Swanson, J.M., and K.A. Forrest (editors). 1984. *Men's Reproductive Health*. Springer Series: Focus on Men, Vol. 3. Springer, New York, NY.
- Thrash, A., M.D. 2006. Prostate disease counseling sheet. Uchee Pines Institute, Seale, AL.
- Wallenchinsky, D., and A. Wallace. 1993. *The Book of Lists: The 90s Edition*. Little, Brown and Company, Boston, MA.
- Wikipedia. 2006. Argument from poor design, a dysteleological argument against the existence of god. www.wikipedia.org. Of interest is the fact that this claim has been dropped in newer versions of this article, such as the version accessed June 21, 2007.



Book Review

Creation's Sensible Sequence

by John B. Mulder

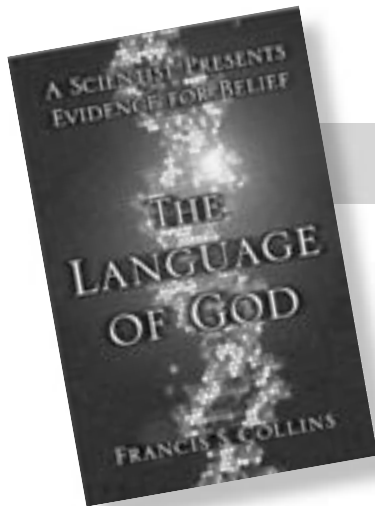
Publish America, Baltimore, 2007, 82 pages, \$10.00.

This small book provides a clear “walk through the creation week.” Author John Mulder is a retired professor and veterinarian living in Kansas. He effectively challenges the big bang and nonliteral creation days, while favoring traditional creation ideas such as the vapor canopy theory. Major emphasis is given to the practical, benevolent aspects of creation.

Thus, mammals are useful for food, clothing, medical research, companionship, transportation, work, sport, hunting, protection, and entertainment (p. 44). A future book edition can clear up some problems: The ocean tides are not caused by earth magnetism (p. 32), the Milky Way galaxy is not recognized as the center of the universe (p. 34),

and there are scores of known planets beyond the seven members of the solar system (p. 38). The book has no figures or index. It concludes with a clear gospel presentation. The author's website is www.jmulder.org.

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Book Review

The Language of God

by Francis Collins

Free Press, New York, 2006, 295 pages, \$26.00.

Author Francis Collins directed the highly successful Human Genome Program during 2000–2005. This project cataloged the three billion letters of our DNA molecular blueprint, the complete human genome. The data would fill two million sheets of paper, a stack 555 feet high—as tall as the Washington Monument (p. 2). The research laboratories of twenty genome centers around the world were utilized.

This best seller describes the author's life struggles and achievements. Dr. Collins is a man of deep faith, and numerous quotes show a strong influence from the writings of St. Augustine and C. S. Lewis. Francis's parents were 1960s-era free thinkers. They lived on a farm in Virginia with no indoor plumbing (p. 36).

During his college days, Collins drifted between agnosticism and atheism (p. 16). A turnabout came in medical school when he observed the testimonies of terminally-ill patients. He also was impressed with the pull of our conscience toward right behavior, called *Moral Law* by C. S. Lewis in *Mere Christianity* (1952).

A central chapter clearly explains details of the Human Genome Program. Also, a 38-page appendix surveys bioethics. And where does Collins land in the creation-evolution issue? As expected, but still disappointing, he fully embraces theistic evolution. Of course, in the cur-

rent naturalistic climate of the National Academy of Science, Collins probably could not survive as a leading science spokesman if he challenged evolutionary doctrine.

Collins believes that the alleged big bang singularity is a direct evidence of the Creator (p. 65). However, the author appears unaware of recent physics-astronomy excursions into theoretical eras before the big bang event. That is, in secular science, the big bang is no longer the beginning of time, but just one episode in a larger picture of cosmic history. Evolution is described as “utterly compelling” (p. 146). As a consequence, in Collins's view, Adam and Eve were not literal people. Instead, we share a common ancestry with apes (p. 200). I am unsure why Collins also challenges the historicity of Old Testament patriarchs such as Jonah and Job (p. 209).

Dr. Collins feels that the term “creationist” has been “hijacked” by literalists (p. 172). Also, he does not like the confusing label “theistic evolution.” As a result, he suggests the new word “biologos” for those who accept God-directed evolution. Others also have tried new titles in the past. Stephen Jay Gould suggested “non-overlapping magisteria” for the distinct worlds of science and religion. Astronomer Howard Van Till uses the term “fully-gifted creation.”

Collins writes strongly against the young-earth creation movement. He

claims that no serious biologist doubts evolution (p. 99). As a member of the American Scientific Affiliation (p. 198), he apparently is unaware of the Creation Research Society membership. Creationists are wrongly accused of insisting that every word of the Bible is literal (p. 175). In conflict with conservative theology and recent RATE findings, he interprets Genesis 1–2 as nonliteral poetry (p. 150).

Author Collins offers several evidences to support his evolutionary stand. First, he claims there is no conflict with the second law of thermodynamics (p. 92). He explains that making a bed or planting a garden results in an increase of order in one place, at the expense of disorder elsewhere. Debate over the implications of the second law has continued for years. Second, when Collins attempts to support macroevolution, his examples are in the realm of microchanges including stickleback fish and mutations of the AIDs virus (p. 132). Third, imperfections in nature are described, including our eyesight (p. 191). Here, Collins is not current on creation research and also does not consider implications of the curse on nature. Fourth, the intelligent design movement is challenged as a “God of the gaps” approach, a ship that is headed “to the bottom of the ocean” (p. 195). Collins suggests that our blood-clotting mechanism, and also the molecular

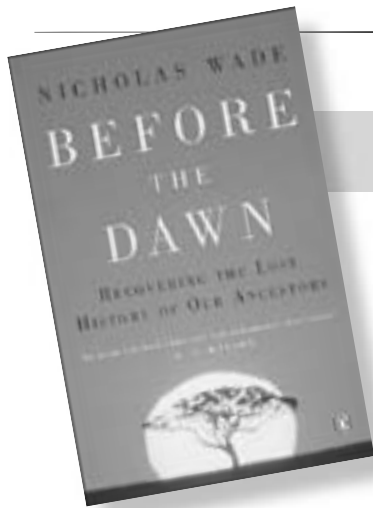
motor of bacteria, could form slowly and by chance. These, he claims are not irreducibly complex. Fifth, jumping genes, molecular homology, and junk DNA are offered as further evidence for macroscopic evolution. However, each of these has been interpreted from the creationist worldview in this quarterly.

Let me conclude the review with an

important question: Can a person hold a consistent theistic evolution worldview and be a believer? That is, can he or she be a child of God, a part of the kingdom? There surely is a range of views in our *Quarterly* readership, and only God knows the human heart. Yet, I am much impressed with the testimony of Francis Collins in this book. He spells

out the gospel message of salvation in detailed, crystal-clear fashion (p. 221). In spite of the fact that he runs with the macroevolutionists, and is used by them, it appears to me that Collins is a man of God.

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Book Review

Before the Dawn: Recovering the Lost History of our Ancestors

by Nicholas Wade

Penguin Group, New York, 320 pages, \$25.00.

The new African genesis in Wade's book has a brave group of pilgrim hominids trying to get out of Africa, but Neanderthals have blocked the passes Suez and Gibraltar. It is 60,000 years ago, and inside the caravan is the holy grail of prehistoric humanity, the true mitochondrial DNA and the legitimate male y chromosome. These genetic credentials must be passed on inviolate. In ambush behind the rocks are the age-old inhabitants of Eurasia, the Neanderthals, war clubs at the ready. This is the story Nicholas Wade sets up in his best-selling book. And so another theory is offered to prop up Darwinism and make it fit the unfolding facts of the human genome.

Let's review: the back-counting of the mutation rate of the y chromosome demands a reducing valve to mark all male humanity. This founding event becomes the fountainhead of all humanity, male and female. By common count,

it happened 60,000 years ago in the African garden. Presumably the females that pass through this checkpoint have already conformed to the mitochondria signature of Mother Eve. Nicholas Wade is a science writer for the New York Times. He is not alone in thinking that genetics would lend itself readily to a grand unified theory of evolution. Rather than a grand synthesis, however, genetics has backed evolution into a corner. If hominids out of Africa cohabit freely with the preexisting cave people of Eurasia, they create an impure strain that is not consistent with genetics. No evolutionary mechanism has been discovered that prevents this fatal merge. It would be convenient to discover a plague that could select against all the archaic cave-men and leftover Australopithecus.

By offering the war scenario, Wade is the first popular science writer I know of to admit the problem and address it. But war could never separate two

anatomically similar races living on the same continent. Nevertheless Wade's final breeding stock of 5,000 is shuffled with a flourish, and out of it comes the two righteous genetic streams required for the founding of the human race. All the happy mutations of modern Homo sapiens are accounted for, and their selecting pressure is itemized. Language is brought forth as a more economical form of social grooming and to help with the organized hunt.

Other milestones of human history read like the paragraph headings of a study Bible. Clothes become necessary to prevent sunburn after we "dropped" our body hair. Murder is recognized as a glitch on our altruistic pathway, but actually may be a sign of higher intelligence: execution of a pesty neighbor would always trump the piecemeal effort of just wounding him.

Joe Fisher

Conference Reports

Proceedings of the Microbe Forum 2007, Answers in Genesis, Petersburg, Kentucky

Introduction

For many years, the roles of microbes as part of God's wonderful design have been neglected. Creationist literature is largely void of topics related to these tiniest of creatures. Perhaps it is because many people associate microbes as the cause of death, disease, and suffering. This is true for only a fraction of microbes; the large majorities are extremely vital for sustaining life on earth. Their roles range from recycling nutrients in soil and water to symbiotic relationships that provide necessary factors to their host. Their role in death and disease is a result of the Fall and the curse on all living things.

The task of creation microbiology is enormous, considering the number of microbial species that have yet to be discovered and characterized. Some estimates put the number of bacterial species on earth at 10 million. If there is a unique bacteriophage species for every bacteria species, then the number of viral species could easily be estimated to be several orders of magnitude greater than 10 million. The task of understanding and observing the microbial world is daunting when one considers that we have documented only around 5000 bacterial species. In addition, there is much yet to be learned about algae, fungi, macroparasites and the enigmatic "chimeric" lichens. Could there be other creatures composed entirely of microbes of which we are unaware? In addition, how do we classify microbes taxonomically from a creation perspective? Do they fit into conventional or baraminic taxonomical convention? How do we view them biblically? What day were they created? What were they originally created for? Were they created as sepa-

rate baramins, or were they created as parts of other organisms? Or were they created as part of the earth on day 3? These are just some of the intriguing questions facing the field of creation microbiology.

Recently, Dr. Joseph Francis has suggested that microbes form the "organosubstrate" of life. They serve as intermediaries between living things and the physical world around them. Just as we have organelles (tiny organs) inside our cells, microbes might be thought of as extracellular organelles that help living things interact with their environment. For instance, it is predicted that microbes reside on every living creature where they have been shown to play long-term beneficial and life-sustaining roles, and thus it appears that microbes could have been created as part(s) of each of the original baramins. Microbes are found in abundance in terrestrial and aquatic environments, where they participate in all major biogeochemical cycles. Therefore, microbes could have been created as part of the soil and during the formation of the great bodies of water on earth. In addition, few microbes operate as isolated single-cell creatures; many cooperate in intricate and complex communities. Some microbes can form elaborate multicellular plantlike structures that include leaf, root, and stemlike configurations. Perhaps microbes existed in these forms more commonly in the pre-Fall garden than they do today. We certainly are not seeing the full picture, but we can observe remnants of the "very good" creation in the microbial world. In this model, pathogenic microbes are seen as a deviation from God's original plan, due to the Fall of man.

Evolutionary theory is quick to point out the relative "simplicity" of microbes and that they represent the common ancestor from which all of life has evolved. New discoveries reported almost daily show microbes are anything but simple. The ability of microbes to adapt to their environment through various genetic mechanisms, such as in the case of antibiotic resistance, is often touted as an example of evolution in action. While this leads to change within a bacterial population, it doesn't support the type of change needed for microbes-to-man evolution. In addition, microbes are unique, differing from animals, plants, and humans in their need for variety to deal with changing environments that they may not be able to escape.

This forum was needed to draw on the knowledge of biblical creation scientists from around the country who have been formally trained and specialize in microbiology. It was hoped that through this vital sharing of knowledge that ideas and models could be discussed and published to bring the topic of microbes to the forefront of creation biology. The forum was held at Answers in Genesis headquarters in Petersburg, Kentucky, June 26–29, 2007.

Abstracts

Creationist Model of Bacterial Mutations Kevin Anderson

Mutations in a bacterial cell may affect the organism's phenotype. This can play a key role in bacterial adaptation to changing environments. Such mutational adaptation appears to have de-

signed features and serves the organism's survival and contribution to ecological niches. However, creationists have tended to have an inconsistent view of such "beneficial mutations" within a creation framework.

Various mutations can be shown to provide a beneficial phenotype to bacterial populations. This phenotype can often undergo strong positive selection, but the effects are generally temporary and limited. Some common examples of beneficial mutations are those involved in adapting to stress conditions. For instance, adaptive mutations are a unique phenomenon used by bacteria to survive very specific stressful conditions. The exact mechanism is controversial but appears to involve a mutation rate higher than random mutations would generate. Various mutations also enable bacteria to survive temporary exposure to high temperatures or starvation. Such mutations usually involve loss of certain sigma factors, DNA repair, or specific regulatory controls. Antibiotic resistance is another example of stress survival. Some mutations potentially enable the bacterium to survive exposure to various antibiotics, but the resistance results from loss or reduction of preexisting activities such as enzymatic, regulatory, or transport systems. Other examples include several subpopulations of mutant strains of bacteria obtained over a period of up to 20,000 generations. These mutants have a greater "fitness" than the wild-type strain. However, analysis shows that most contained deletion mutations in various genes.

These examples entail mutations that are phenotypically beneficial under certain environmental conditions. However, these mutations also frequently eliminate or reduce preexisting cellular systems and functions. This has been referred to as *antagonistic pleiotropy*, a temporary benefit for surviving one environmental condition at the expense of systems used for other environments. If the environmental conditions change,

the mutation usually becomes less beneficial and perhaps even detrimental. As such, beneficial mutations in bacteria fit well in a creation model where biological systems and functions were fully formed at creation, and some subsequent mutations can provide conditional benefits even though the mutation is generally degenerative. Also, mutations give bacteria the ability to rapidly adapt to ever changing environments and food sources.

How Do Mitochondrial Ribosomes Fit into the Theory of Endosymbiosis? **Daniel Criswell**

The endosymbiotic theory postulates that eukaryotic cells arose from the symbiosis of smaller aerobic prokaryotes living within a larger prokaryote. These symbionts evolved an interdependence of biochemical systems leading to the development of eukaryotes with specialized organelles such as mitochondria. The mitochondria of mammalian cells and other eukaryotes are theorized to be the descendants of aerobic prokaryotes that were engulfed by larger prokaryotes. This assumption was based partly on the notion that ribosomes found in the mitochondria would be similar to the 70S ribosomes found in prokaryotes. However, it is now apparent that ribosomes in mammalian mitochondria and other eukaryotes are unique, with little resemblance to prokaryote ribosomes.

Prokaryote 70S ribosomes are 2/3 ribosomal ribonucleic acid (rRNA) and 1/3 protein by weight, while mammalian mitochondrial 55S ribosomes are 2/3 protein and 1/3 rRNA, making the 55S ribosome heavier but more porous than the 70S ribosomes. Structural analysis has confirmed this and shows that the internal structures of prokaryote ribosomes versus mitochondrial ribosomes are quite different. There is no significant sequence homology between mitochondrial and prokaryote ribosome nucleic acids or proteins except at the functional

sites of the ribosomes, which is expected. In fact, eukaryote 80S cytosolic ribosome sequences are more conserved than mitochondrial ribosomes in relation to prokaryote ribosomes. Nearly all of the peripheral portions of the 55S ribosomes are not homologous to 70S ribosomes in sequence or protein/rRNA content.

It is widely accepted that the amount of rRNA has been reduced over evolutionary time from prokaryotes to mammalian mitochondrial ribosomes and replaced by proteins recruited from the nuclear genome. However, *Reclinomonas americana*, frequently presented as a close link to prokaryotes, has more rRNA than most prokaryotes, as does the yeast *Saccharomyces cerevisiae*, and the vinegar eel *C. elegans* has even less rRNA than mammals.

The significant differences in global ribosome structure, sequence homology, and even evolutionary phylogeny contradict the expectations of traditional endosymbiotic theory. Based on these differences, the endosymbiotic theory of eukaryotic origins should be rejected.

Creation Microbiology and the Origin of Disease **Joseph Francis**

Many pathogenic microbes appear to be altered when compared to non-disease-causing microbes. Creationists suggest that this alteration may have occurred as a result of the Fall. However, some microbes may cause disease, not because they are altered in some fashion (through genetic changes), but because they have spread to a location that allows them to invade an organism they were not created to interact with.

Consider, for instance, the cholera-causing bacterium *Vibrio cholera*. This bacterium secretes several factors that are involved in virulence. However some of these same virulence factors have been shown to promote growth of *Vibrio cholera* on chitin. Chitin is the most abundant polysaccharide in the ocean because it is a major component of

many exoskeleton-bearing sea creatures like shrimp, lobsters, and crabs. *Vibrio cholera* and other *Vibrio* species appear to be intricately involved in the degradatory cycle of chitin and appear more fit for this environment than other locations in which they are found. The *Vibrio cholera*-induced breakdown of chitin promotes a major influx of carbon into the ocean environment. Several events must occur to move *Vibrio cholera* from the chitin-rich environment into a location where they cause disease in humans. For instance, *Vibrio cholera* is found off the coasts of many countries, but cholera occurs as an epidemic in only a few locations. In addition, epidemics tend to take place after the occurrence of certain extreme weather conditions. Furthermore, there is some evidence to suggest that cholera toxin, which causes major loss of salts from the human body, may promote life-sustaining salt metabolism changes in sea creatures that move from freshwater to saltwater environments.

From a creation view, it appears then that the origin of microbial-based disease has at least two primary causes: (1) post-Fall genetic alteration of the original good microbe and/or (2) post-Fall displacement or movement of the microbe from the site where it performed its beneficial function. This work was first presented at the fifth annual meeting of the Creation Biology Study Group, 2006 (Occasional Papers of the BSG 8:14, 2006).

Using *Serratia marcescens* as a Model to Elucidate Aspects of Germ Genesis in Bacteria

Alan L. Gillen

For creationists, biblical studies and current microbiological research suggests that factors leading to pathogenicity in bacteria may be attributed to the fall of man and the curse on the original “good” creation, which is now undergoing decay. The origin of bacterial diseases is complex and multifaceted and may be

explained by a combination of factors, including mutations, mobile genes, and man’s protective defense mechanisms. The hypothesis is that a common pattern in the origin of bacterial diseases found in many is the modification and displacement of originally ‘good’ bacteria.

A common focus among creationists has been the degeneracy in genomic pathways that lead to pathogenesis. Most bacterial diseases are too complex to be the result of the simple deterioration of a bacterial genome. A more likely genome “recipe” for germ genesis is to reduce, add, and “stir” the DNA. The loss of genomic and metabolic pathways has been typically understated in the evolutionary biology literature.

The bacterium *Serratia marcescens* may serve as a model for genomic decay leading to pathogenicity. *Serratia marcescens* is noted for the production of a bright red pigment called *prodigiosin*. The metabolic pathways involved in *prodigiosin* production are numerous and complex, so mutations affecting any of these pathways could result in loss of pigment production. Most (70–93%) *Serratia* infections are caused by naturally occurring white mutants, which also often bear antigenic flagella and appear to be more host dependent.

In the initial stages, we seek to develop and elucidate a research model using *Serratia marcescens*. UV irradiation can transform *prodigiosin*-producing organisms into non-producing white mutants. In our experiments to maximize random mutations correlated with loss of *prodigiosin*, radiation time influenced mortality and the number of white mutants that grew. The degeneracy of *prodigiosin* production in our experiments has some similarity (i.e. some UV white mutants have greater motility and have lost some metabolic capabilities) to that in clinical strains (933 and WF), suggesting a possible link to pathogenicity. The initiation rate and degree of pathogenicity in the UV white mutants is unknown, but those that develop numerous flagella are

more likely to become pathogenic via transduction or another undetermined mechanism(s). Future investigations will explore this inverse relationship of *prodigiosin* production with motility (i.e. flagella), pathogenicity, and host dependency. Germ genesis in *S. marcescens* (from saprophyte to pathogen) appears to be a good model of bacteria that first lost metabolic pathways, then acquired foreign genes (phages), and finally had its DNA “stirred.” A once harmless saprophyte has now become an opportunistic pathogen.

Viral/Bacterial Attenuation and Its Link to Innate Oncolytic Potential: Implications of the Perfect Original Creation in the Beginning

Luke Kim

The Bible tells us that microorganisms such as bacteria and viruses were created by the Lord (Col. 1:16). Since the discovery of microorganisms, they have been mainly recognized as disease-causing agents. However, most microorganisms are benign (indirectly beneficial) or beneficial to humans or other organisms. For example, recent cancer/molecular biology studies show that many benign or attenuated bacteria/viruses are powerful anticancer agents, specifically targeting cancer cells while sparing the normal ones. Even pathogenic strains of bacteria and viruses can be attenuated to convert them to oncolytic viruses or bacteria. Currently, some of these oncolytic viruses and bacteria are being used for various stages of clinical trials for anticancer therapy.

The Bible suggests (Gen. 3:18) that post-Fall viral/bacterial oncolytic activity may have arisen as a phenotypic extension of preexisting normal viral/bacterial activities (possibly serving a role as apoptosis inducer, activator of cellular signalling pathways, etc.) due to a change to harsh biological environments. Ubiquitousness and persistence of these microbes in the biological eco-

system strongly implicate a beneficial microbe-host interaction in the original creation and subsequent disruption of the beneficial microbe-host interaction after the Fall. Nonetheless, due to their genetic flexibility, some viruses and bacteria today still display some of their original/derivative functions, such as oncolytic activity. The study of beneficial microbe-host interactions will help us comprehend the correct biological view of microorganisms (before and after the Fall) from a biblical perspective.

Endogenous Retroviruses: Remnants of Germline Infection or Created in the Cell?

Yingguang Liu

The genomes of all vertebrates and humans harbor multiple copies of endogenous retroviruses (ERVs), most of which are replication-deficient. The endogenization theory has been proposed by evolutionists to explain the origin of ERVs, i.e., they diverged from exogenous retroviruses that infected the germline of the host's ancestors. The best evidence for the theory is that some modern exogenous viruses can infect the germline and be inherited. However, the theory is contradicted by several obvious facts: 1. Stable endogenization of modern exogenous retroviruses is rare in nature. 2. Xenotropic ERVs reside in cells that have no receptor for them. 3. Essential beneficial functions of some ERV genes and irreducibly complex coordination between ERVs and host DNA sequences argue for coexistence of ERVs and the host from the beginning.

Several instances of beneficial ERVs have been observed. Recently, there has been much investigation on the function and regulation of syncytins, which are the *env* proteins of ERVs. Syncytins have been shown to be critical for inducing cell fusion during placenta development. Efficient tissue-specific expression of human syncytin-1 requires cis-acting elements in both the ERV and host sequences (including an enhancer)

upstream of the ERV. Furthermore, expression of syncytins is under the control of host sex hormones. If the syncytins are indeed essential for mammalian reproduction, they appear to be components of an irreducibly complex system that have to be created together to perform the intended function.

These findings suggest that at least some ERVs must have been incorporated into the initial design of eukaryotic life. Exogenous retroviruses might have been created simultaneously for the maintenance of ERVs or for transduction of cellular genes.

Pathogenicity Tools and Mycotoxins: In the Beginning or after the Fall?

Ira S. Lucks

Fungi are amazing organisms. As a group, they have colonized practically every ecological niche on earth. Originally created "very good," certain fungal interactions have degenerated over time, resulting in serious human and animal diseases. Fungi are also capable of producing powerful compounds called *mycotoxins*, which are products of the nonessential processes of secondary metabolism. Mycotoxins are a type of secondary metabolite, and as such are not normally required for normal growth and reproduction. In fact, one particular mycotoxin, ergot alkyloid, may have been the cause of the Salem Witch Trials. Consumption of ergot alkyloid can result in hallucinations, convulsions, and gangrene of the extremities. Other mycotoxins are potent carcinogens, while others are immunosuppressive. However, other secondary metabolites are useful. Many antibiotic drugs including penicillin and cyclosporin are secondary metabolites. Likewise, many cholesterol-lowering drugs are based on the "statin" class of secondary metabolites.

Fungi have been important in agriculture for centuries as both commodities and crop pests. Much of our

understanding of fungal biology stems from research on plant pathogenic fungi. Since the Fall, many plant-fungal interactions have deteriorated into parasitic and/or pathogenic relationships: biotrophic, hemibiotrophic, and necrotrophic interactions. These interactions result in famine and potential contamination of crops with toxins harmful to humans and animals. Also of concern is the expansion of medically relevant fungi. Fungal pathogens are difficult to treat in humans and animals due to the similar biochemistry of fungal and animal systems. Recent research demonstrates a possible mechanism for the rise of animal pathogenesis in fungi: co-opting of environmentally relevant survival mechanisms for survival in the host environment. More research is needed to elucidate the means by which these originally "very good" microorganisms devolved into the destructive pests and pathogens they have become.

Adaptive Mutation and the E. coli *ebg* Operon

Georgia Purdom

Much research has been done on the *ebg* ("evolved β -galactosidase") operon of the bacterium *Escherichia coli* over the last 30 years. It has been observed that in this operon specific mutations occur (at codons 92 and 977 in the *ebgA* gene that codes for the *ebg* β -galactosidase) that enable the bacterium to metabolize lactose sufficiently to allow growth. Interestingly, these mutations occur when an *E. coli lacZ* (gene for β -galactosidase in the *lac* operon) population undergoes carbon starvation in the presence of lactose. These mutations have been termed "adaptive mutations," as they are not found when the bacteria are subjected to different adverse environmental conditions. Adaptive mutations are widely accepted as an example of "evolution in action."

Hall's work needs critical evaluation. Mutations in the *Ebg* system are clearly not an example of evolution but of muta-

tion and natural selection, allowing for adaptation to the environment. A major implication of this research is an understanding that adaptive mutation makes limited changes, which severely restrict its use as a mechanism for evolution.

Adaptive mutations can readily fit within a creation model, where adaptive mechanisms are a designed feature of bacteria. Further understanding of these mutations in the *ebg* operon may help the development of a creation model for adaptation of bacterial populations in response to the adverse environmental conditions in a post-Fall, post-Flood world.

Creation, Evolution and Protozoan Parasites **Frank Sherwin**

Parasites are viewed as odious creatures (indeed, most are!) tolerated and studied only because of economic impact and misery given to beast and man. What does science really know regarding protozoan parasite origin?

Scripture doesn't say anything about parasites, but they are living creatures and therefore had to be created by God. But God's original creation was very good, which means these creatures at one time briefly had a good/neutral function. There are extant protozoa living mutualistically in some termites and ambrosia beetles that secrete cellulolytic enzymes. Such degradation results in a source of nutrition, while the protozoa derive protection in the insect gut.

I would like to present a possible origin of protozoan parasites from a creation worldview. Four groups are addressed: *Plasmodium*, trypanosomes, ciliates, and amebas. The creationist must confront the question of their origin (as with all parasites): Were they present before the Fall in a dormant capacity, or did they have some other function? Protozoan populations may have lived symbiotically or mutualistically in man and animal before the Fall, only to take on a parasitic mode after the

Fall. For example, the bacterium *Vibrio cholera* causes the human intestinal disease cholera. The infection is deadly because of the toxin the bacteria secrete. Could this toxin have had an alternative function before the Fall? A very similar toxin is produced by *V. fischeri*, a curious light-emitting symbiotic bacterium found in the Hawaiian bobtail squid. *V. fischeri* is not fatal to the squid but are in a complex symbiotic relationship— in return for producing light, the bacteria receive nutrients from the squid. Could this also be true for protozoa that may have had a mutualistic existence in man before the Fall? Or did they adapt (resulting in parasitism) after the Fall, particularly after the Flood, when there were drastic environmental conditions requiring rapid changes? Adaptation for some protozoa would possibly be significant, but not in a macroevolution-

ary sense. Examples include *Naegleria* (Order Schizopyrinida), causative agent of primary amebic meningoencephalitis. The parasite must adapt from a biflagellated form without pseudopodia in water to an actively reproducing stage in a host that is able to avoid or neutralize the sophisticated immune system response. This also includes the parasite's ability to immediately adjust physiologically to the new environment of the host (i.e., temperature, pH, electrolyte gradients, CO₂/O₂ concentrations, etc.).

Carl Zimmer said in *Natural History* (Sept., 2000) that parasites were perhaps the dominant force in the evolution of life. Creation scientists counter that parasites do not contribute to change but had beneficial roles as a part of God's "very good" original creation and have degenerated leading to their collaboration in the effects of the Curse.

Worldview Affects Scientific Interpretation: Same Data, Different Conclusions

Many evolutionists would have you believe that creationists cannot conduct real science. These evolutionists have used their powerful positions in the scientific community to consistently censor any research with a creationist viewpoint from publication in scientific journals.

This is not because of inferior science by creation scientists, but from their preconceived biases.

Now you can meet creation scientists, examine their original scientific research firsthand, and ask your own questions about origins research.

Join our **Creation Research Conference** on **April 11–13, 2008**, and hear presentations by several scientists from the Creation Research Society.

Grace Bible Church
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Free admission

For more information call 406-587-0455 or email efishbaugh@wildblue.net.

Letters to the Editor

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

Postmodernism and Relativism

Thanks to Dr. Kevin Anderson for the timely editorial in the Fall 2007 issue of the *Quarterly*. No doubt I am far from the only one to point out how postmodernism is inimical to the scientific method (Klevberg, 2000, pp. 38, 39, 43). His description of his encounter with the college professor and the path of the “emergent church” is important for all of us to understand. My only quarrel with his editorial is his statement that “relativism began to creep into many postmodernist writings” (Anderson, 2007, p. 73). It did not; relativism is foundational to postmodernism, as clearly seen in its development through

the contributions of Derrida, Foucault, Lyotard, and others. Postmodernism (or deconstructionism, contextualism, poststructuralism, or “nonreason,” to quote Francis Schaeffer’s prescient description) denies universals, leaving it with only particulars. This can only equate with relativism. It is also the child of existentialism, which is also relativistic. It is, as Schaeffer called it, “antiphilosophy.” Postmodernism is not just a rejection of modernism’s claims of universals based on human reason and experience alone; it is also a rejection of any claims for universals. That clearly

denies not only Christianity, but also the research method of natural science that Christianity spawned (cf. Reed, 2001).

Anderson, K. 2007. “Postmodern creationists?” *CRSQ* 44:73–74.

Klevberg, P. 2000. “The philosophy of sequence stratigraphy—Part II: application to stratigraphy.” *CRSQ* 37:36–46.

Reed, J.K. 2001. *Natural history in the Christian worldview*. Creation Research Society Books, St. Joseph, MO.

Peter Klevberg
Great Falls, MT

Response to “Postmodernism and Relativism”

I agree with Mr. Klevberg that relativism is foundational to postmodernism. My comment was meant to reflect that postmodernists (certainly those with whom I have corresponded) do not associate themselves with relativism. However, as

Mr. Klevberg and I both agree, it is an integral part of their philosophy, regardless of their desire to distance themselves from it.

Kevin Anderson, Ph.D.
Editor

Errata

On page 155 of the Fall *CRSQ*, the following sentence appears: “When the environmental temperature drops to freezing, or 0 degrees Celsius, the spadix temperature can be maintained at 25 degrees Celsius, or 45 degrees Fahrenheit (Knutson, 1972).” This should read “77 degrees Fahrenheit.”

In “The Range of Sizes of Galactic Supernova Remnants” in the March 2007 *CRSQ*, there is an error in Appendix B on page 247. The relation $D = 1000 \pi \theta d / (180 \times 60)$ should have been written as $D = \pi \theta d / (180 \times 60)$.

CRSnet Brochures

It may be of interest to the CRS membership that a number of us involved with the Society's email forum, the CRSnet, have recently produced two brochures. These are: Reasons to Reject Evolution and Reasons to Affirm a Young Earth.

The first piece lists thirty reasons to set aside the idea of evolution. While the reasons are not exhaustive in their explanations, they present enough thought that a person might be encouraged to take a closer look at what he or she believes to be true. The second piece lists fifty reasons to question the old earth position. These reasons are collected under: Dinosaurs & Humans,

Man, Geology, Catastrophe, Astronomy, Bible & Church.

If nothing else, these two works can refresh our own minds in order to be better prepared when questions arise. Early reports indicate these publications are already having an impact.

The group is presently working on a third piece. Although yet to be titled, the concept is to address additional problems with evolution.

Each of these brochures is attractive and a good evangelistic tool. They are inexpensive and easily available.

The work on these was under the guiding hand of Paul Humber of Phila-

delphia. For more information, contact Paul G. Humber: paulhumber@Verizon.net or www.CRMinistriesPhilly.com, 327 Green Lane, Philadelphia, PA 19128, (215) 483-9846.

Meanwhile may I encourage other CRS members to consider joining us on the CRSnet. Information on how to join can be found elsewhere in this CRSQ.

Sincerely,
Dan Schobert
Plover, Wis 54467
W9MFG@Charter.net

Erratum

In "Lava Extrusion and the Age of Iceland," page 135 of the Fall CRSQ, the following figure should have appeared as Figure 21.

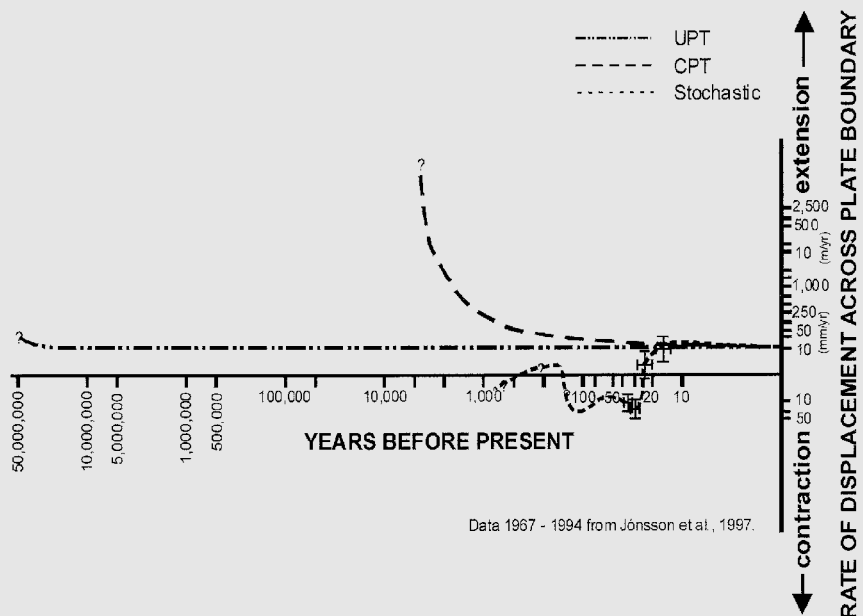


Figure 21. Comparison of three disparate historic plate motion scenarios. The accepted spreading rate between the North American and Eurasian plates is approximately 19 mm per year (Feigl et al., 2000, pp. 25, 655; Jónsson et al., 1997, pp. 11, 918), but the great disparity between this accepted value and observations has prompted some to look for a "leaky microplate" solution (Foulger and Anderson, 2005).

Minutes of the 2007 Creation Research Society Board of Directors Meeting

On Thursday, 7 June 2007 a meeting of the Board of Directors (BOD) was held at the Embassy Suites Motel, Phoenix, Arizona, from 1900 hours to 2100 hours to plan for the committee meetings and to proceed with some preliminary actions, e.g., approval of the 2006 minutes, budget instructions, and reports from the lab and periodicals committees. Present were: M. Armitage, T. Aufdemberge, E. Chaffin, D. DeYoung, R. Humphreys, G. Howe, D. Kaufmann, L. Lester, M. Oard, R. Samec, and G. Wolfrom, and staff members K. and D. Anderson. Not able to attend: D. Faulkner, G. Locklair, J. Reed, and D. Rodabaugh. The 2006 minutes were approved as published in the *CRSQ*. Armitage reported that the following were elected to a three-year term to the BOD: D. DeYoung, R. Humphreys, D. Kaufmann, L. Lester, G. Locklair, and R. Samec.

The lab committee report by DeYoung stated that in the coming year the number of trees on the lab property will be reduced, some shingles will be replaced on the publications building, the lab and book building will be painted, the mailbox will be moved to the same side of the highway as the lab, and the RV that had been donated to the CRS will be sold.

The periodicals committee reported its recommendations for payment of part-time staff, the activities of its editors, and the possible addition of new section editors for the *Quarterly*. The recommendations of the committee were approved by the board. The meeting was adjourned at 2100 hours.

On Friday, 8 June 2007 the BOD and staff traveled to the Van Andel Creation Research Center (VACRC) in Chino Valley, where the lab, Internet,

research, publications, finance, membership, *Quarterly*, *Creation Matters* and constitution/bylaws/advanced planning committees each met separately for approximately one and one-half hours to plan for the closed business meeting on Saturday. During lunch, a financial presentation was made by Darline Wood, who is currently doing the annual accountant reviews for CRS. During supper, special presentations



were made to board members for years of service: Russ Humphreys (15 years) and George Howe (41 years).

On Saturday, 9 June 2007 the meeting of the full BOD was held at the Embassy Suites Motel (Phoenix, Arizona) from 0830 hours to 1230 hours. Present were: M. Armitage, T. Aufdemberge, E. Chaffin, D. DeYoung, R. Humphreys, G. Howe, D. Kaufmann, L. Lester, M. Oard, R. Samec, G. Wolfrom, and staff members K. and D. Anderson. Not able to attend: D. Faulkner, G. Locklair, J. Reed, and D. Rodabaugh.

The membership committee reported that the total of memberships and subscriptions for the past membership year (June 2006–May 2007) remained stable at 1722. The breakdown by category was: voting, 690; sustaining, 710; subscriber, 298; and student, 24. The

number of voting members decreased slightly, while the number of sustaining and student members increased slightly. Members and subscribers in the USA and outside the USA numbered 1,536 and 186, respectively. There were 277 life members, 240 senior members, and 223 library subscribers.

A lengthy discussion was held regarding the impact of new postal rates on the cost of the postage surcharge for foreign memberships and subscriptions. The two categories for surface mail (“economy” for single mailings, and “books” for bulk mailings) have been eliminated by the United States Postal Service. The new foreign mail category, called “First Class Mail International” (FCMI), is essentially equivalent to the old airmail rates (with an additional price increase). On the positive side, delivery time will

be significantly improved for those who had previously received the journal by surface mail. However, for most of our members and subscribers outside the USA, there will be a substantial increase in membership and subscription rates to capture the increased cost of postage. The new, board-approved annual rates are listed in Table I.

Because of the additional burden that this postage increase places on our international supporters, the membership committee recommended, and the Board approved, a paperless option for which the members will have all the benefits of membership but will not receive printed copies of the *CRSQ* and *Creation Matters*. This includes, of course, the benefit of access to the electronic version of these publications via the website. The annual cost of the paperless option will be \$31 for regular

Table I. Membership and subscription rates.

Category	Printed copies of publications			Paperless (access to electronic versions only)
	US	Canada, Mexico	Other Countries	
Regular members (voting / sustaining)	\$35	\$53	\$70	\$31
Senior and student members	\$30	\$48	\$65	\$26
Subscribers	\$38	\$56	\$73	not yet available

members, \$26 for seniors and students. For the near future, the paperless option cannot be made available to subscribers. These fee changes will become effective as soon as the application forms and website information can be updated. Additionally, the committee recommended, and the Board approved, an immediate increase in the life membership fee from \$350 to \$500.

The publications committee reported that overall book sales have declined by 4%, but the number of orders has remained the same, meaning that the amount per order has declined slightly. Also, the committee reported they are well under budget for various

reasons. It was passed that we accept Master Books as our copublisher under arrangements discussed. We are having Master Books publish all future road logs. Also, the second edition of the Carl Froede book will be published by Master Books, with the stipulation that CRS purchase the first 500. Master Books also will publish the Oard/Reed book under the tentative title: *Rock Solid Answers: Responses to Popular Objections to Biblical Geology*.

The CRSQ on CD will again be updated by George Hunter.

The member discount in the CRS bookstore will be continued and will be evaluated at the next BOD meeting. A sum of \$5000 was proposed for an upgrade of the online bookstore. There was a discussion of steps to market books by using the newsletter to advertise new books. There is already a promotion of new books online.

The constitution committee report resulted in the BOD's passing a proposal to delete the office of financial secretary from Article I of the bylaws. The treasurer will assume the functions of the financial secretary. This amendment will be voted on at our 2008 annual meeting after notification of all BOD members prior to the meeting.

The Internet committee reported that the visits to the CRS website (www.creationresearch.org) appear to have leveled off in the last year. The most recent monthly statistics reveal approximately 76,000 "page-reviews" and 38,000 unique "sessions." Total website income for the past year (including memberships and donations as well as publication sales) was down 3.3%. Revenue from Internet publication sales alone decreased 16%. The Web site continues to serve as the primary source (85%) of new members. A list of current e-mail address aliases using the "creationresearch.org" domain was distributed. At the conclusion of the membership year (May 31), there were 577 registrants for the members-only area of the website, compared to 450 for the previous year. The primary feature of the members-only section is immediate access to the current CRS periodicals. The Web site's directory of local and international will be updated by M. Armitage. We will investigate improvements and upgrades to the Web site that might help streamline member-discounted purchases through the online bookstore. A modest gift will be awarded to our volunteer webmaster, Fred Williams,



in recognition of his much-appreciated service to the society.

Two other Internet-related activities were reported. First, CRSnet remains viable as the listserv-based, e-mail discussion forum for the society. Approximately 200 members are registered, with about 160 participants receiving the numerous daily e-mails on various topics. Second, a CRS Weblog (www.crsblog.org) has been created to focus additional attention on the CRS. Abstracts from publicly available CRSQ articles are “blogged,” together with links to the full articles on the Web site.

The research committee reported that two new proposals and extensions of funding for four old projects were approved. Mark Armitage, George Howe, and Michael Oard reported ongoing research that is supported by the research committee.

The financial secretary’s preliminary report showed that the value of our investments grew by almost 10% during the first eleven months of this fiscal

year. He stated that this investment will give us an estimated 6.7% return in our investments. The finance committee recommended to the BOD that the financial secretary be allowed to base future reports on a yearly basis beginning with May 1 and ending April 30. This motion was passed. The BOD approved the finance committee’s recommendation that the CRS office in Chino Valley be permitted to open a money market account into which they may invest surplus funds-until they are needed.

The BOD also passed the finance committee’s recommendation that the financial secretary send to the offices in Chino Valley the amount our investments earned during the 2006–07 fiscal year, minus the amount the CRS would have earned in interest had we not borrowed from ourselves. The finance committee presented to the BOD an unbalanced budget. The BOD passed a budget of \$307,800 by authorizing the borrowing of up to \$24,000 from the CRS’s non-endowment investments with

the hope that we will not need this. The financial secretary asked to be relieved of his responsibilities after completing his duties for the 2007–08 fiscal year. This request was granted.

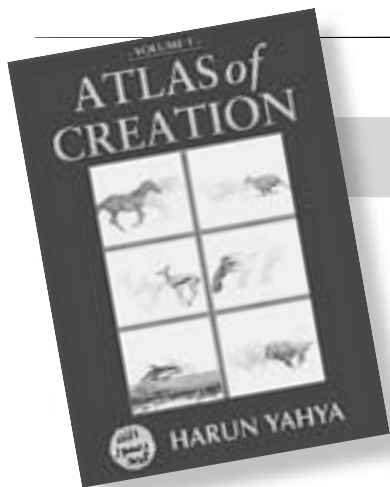
It was passed to nominate T. Aufdemberge, D. Faulkner, M. Oard, and D. Rodabaugh for the 2008 BOD election. It was passed to set the BOD size at 14 for the coming year.

The following officers were elected for 2007–08: President, D. DeYoung; Vice President, E. Chaffin; Recording Secretary, D. Kaufmann; Treasurer, G. Locklair; Financial Secretary, T. Aufdemberge; and Membership Secretary, G. Wolfrom.

It was passed to hold our 2008 BOD meeting on June 13, 14 and 15 at Answers in Genesis headquarters in Petersburg, Kentucky.

The meeting was adjourned at 1230 hours.

Respectfully submitted,
David A. Kaufmann,
Recording Secretary



Book Review

Atlas of Creation, Vol. 1

by Harun Yahya

Global Publishing, Talatpasa Mah. Emirgazi Caddesi Ibrahim Elmas Is Merkezi A Blok Kat 4 Okmeydani, Istanbul, Turkey, 2007, 800 pages, No price listed.

The appearance of this book is awe-inspiring, but its underlying message could be alarming. Major themes are creation, anti-Darwinism, especially from the fossil record with more than 600 full-color pages, and the promotion of Islam, which the author considers to be “true religion” (p. 2).

The tome weighs 13 pounds (6 kg) and has a heavy red cover 38 cm long, 27 cm wide and 5 cm thick. Accompanying the book is a CD with an hour-long illustrated and music-punctuated commentary, primarily on the fossil record. It states repeatedly that fossil forms are exactly the same as living specimens today and there

is no fossil justification for evolution. This is a verbal echo of the book’s emphasis, even though standard mainline geological dating is not questioned. For example, The Mesozoic era was “248 to 65 million years ago” (p. 35).

The specified author is Harun [Aaron] Yahya [John], which is a pen

name for Adnan Oktar (p. 4). There are fascinating critiques of this man on Turkish web sites. Beyond the 800 pages of the volume are another 20 pages picturing additional books by Yahya and translations of them. Each of these pages has colored photos of the covers of 36 different books, totaling about 700 different books. Author Yahya's 1956 birth was in Ankara, and he is Turkish-university educated.

Darwinism, the author says, "is the biggest scandal in history, founded entirely on lies, fraud, and irrational and illogical claims" (p. 587). When Allah wants something, "He merely says 'Be!' and it is." (Part 1, Surah 2 Al-baqara, 117). Thus we have "flawless [intelligent] design" (p. 627).

On page 794, when dealing with time as a "relative perception," Yahya says that "time may flow at different paces in different settings" and quotes Surat al-Hajj, 47, which says, "Verily a Day in the sight of your Lord is like a thousand years of your reckoning" (also see Part 21, Surah 32 As-sajda, 5). Interestingly, the Bible clearly stated this concept more than half a millennium earlier (2 Peter 3:8). The author's advice is to "get a Qur'an as soon as possible and read God's book with an open heart and a conscientious and unprejudiced view and learn the original religion from its true source" (p. 744). However, Christianity predates the Qur'an by more than 500 years.

The book has more than 200 sources cited in footnotes and endnotes, the most recent treatise being 2001. Only five publications from 2000-2001 are listed. Leading scholarly creationist literature from the Creation Research Society, Creation Science Fellowship, Creation Science Movement, Institute

for Creation Research, Answers in Genesis, Geoscience Research Institute, and Creation Ministries International are not referenced. However, there are citations from some recent scholarly anti-evolutionary books, including *Evolution: A Theory in Crisis* (M. Denton, 1985), *The Mystery of Life's Origin* (C. Thaxton et al., 1984), *The Origin of Species Revisited* (D. Forsdyke, 2001), *Darwin Retried* (N. Macbeth, 1971), *Of Pandas and People* (P. Davis et al., 1989), *Darwin's Black Box* (M. Behe, 1996), and *Icons of Evolution* (Wells, 2000).

Yahya writes dogmatically, for example, "Not one single fossil has pointed to any transition between living species" (p. 19). He claims there are no changes when fossil plants and animals are compared with living types. But he does indicate that, for humans and other creatures, the changes all would be within the species (p. 587). Interestingly, the Koran indicates that Allah "created man from a clinging clot" (Part 30, Surah 96 At-alaa, 2).

On page 729 is a diagram of dog variation. A type of wolf is shown to be the ancestor of the dog varieties. But the wolf actually is classified in a different species from modern dogs. So for this reason, the biblical term "kind" would have been preferable to "species" for this larger group.

According to Yahya, "Darwinism and the materialist philosophy it supports" (p. 616) led to Nazism, Communism, and terrorism. There is a photo of the smoking twin towers in New York City for which he essentially blames Darwinism, "the root of the terrorism" (p. 621). Then Yahya turns around and proclaims that Islam (along with Christianity and Judaism, p. 621) is the solution for terrorism because it is tolerant and

"is a religion of peace and well-being" (p. 622).

I obtained a copy of the Koran from a local mosque in New Jersey, and I find it to be a *mélange*. Some quotes follow pertaining to so-called peace and toleration: "The Jews have striven against Allah's revealed order" (Part 6, Surah 5 Al-ma'ida, 32 commentary); "The only reward of those who made war upon Allah and His messenger and strive after corruption in the land will be that they will be killed or crucified, or have their hands and feet on alternate sides cut off, or they will be expelled out of the land" (Part 6, Surah 5 Al-ma'ida, 33); "Slay the polytheists wherever you find them, and take them (*captive*) and besiege them, and lie in ambush for them everywhere" (Part 10, Surah 9 At-tawba, 5); "If they [converts to Islam] turn back (to enmity) then seize them and slay them wherever you find them" (Part 5, Surah 4 An-nisa, 89); "Fighting is obligatory for you, though it be disliked by you" (Part 2, Surah 2 Al-baqara, 216); "Fight against those from among the People of the Scripture who do not believe in Allah...and who do not adopt the religion of truth" (Part 10, Surah 9 At-tawba, 29).

Yahya's book represents a massive amount of work in collecting and compiling material in an absolutely beautiful presentation. But with all of its size and beauty, basically it is like a meal of somewhat older science flavored strongly with Islam. I personally, as a scientist and creationist, feel that the response of scholars to the book will be much more negative than positive.

Wayne Frair, Ph. D.
1131 Fellowship Road
Basking Ridge NJ 07920

Instructions to Authors

Submission

Submit an original plus two copies of each manuscript to the editor of the *Creation Research Society Quarterly* (see the inside front cover for address). Concurrent submission of an electronic version (Word, WordPerfect, or Rich Text Format) of the manuscript text and graphics is also encouraged. The manuscript and graphics will not be returned to authors unless a stamped, self-addressed envelope accompanies submission. Manuscripts containing more than 30 pages are discouraged. An author who determines that the topic cannot be adequately covered within this number of pages is encouraged to submit separate papers that can be serialized.

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

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

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

Appearance

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

Submitted manuscripts should have the following organizational format:

1. Title page. This page should contain the title of the manuscript, the author's name, and all relevant contact information (including mailing address, telephone number, fax number, and e-mail address). If the manuscript is submitted by multiple authors, one author should serve as the corresponding author, and this should be noted on the title page.

2. Abstract page. This is page 1 of the manuscript, and should contain the article title at the top, followed by the abstract for the article. Abstracts should be between 75 and 200 words in length and present an overview of the material discussed in the article, including all major conclusions. Use of abbreviations and references in the abstract should be avoided. This page should also contain at least five key words appropriate for identifying this article via a computer search.

3. Introduction. The introduction should provide sufficient background information to allow the reader to understand the relevance and significance of the article for creation science.

4. Body of the text. Two types of headings are typically used by the CRSQ. A major heading consists of a large font bold print that is centered in column, and is used for each major change of focus or topic. A minor heading consists of a regular font bold print that is flush to the left margin, and is used following a major heading and helps to organize points within each major topic. Do not split words with hyphens, or use all capital letters for any words. Also, do not use bold type, except for headings (italics can be occasionally used to draw distinction to specific words). Italics should not be used for foreign words in common usage, e.g., "et al.", "ibid.", "ca." and "ad infinitum." Previously published literature should be cited using the author's last name(s) and the year of publication (ex. Smith, 2003; Smith and Jones, 2003). If the citation has more than two authors, only the first author's name should appear (ex. Smith et al., 2003). Contributing authors should examine

this issue of the *CRSQ* or consult the Society's web site for specific examples as well as a more detailed explanation of manuscript preparation. Frequently-used terms can be abbreviated by placing abbreviations in parentheses following the first usage of the term in the text, for example, polyacrylamide gel electrophoresis (PAGE) or catastrophic plate tectonics (CPT). Only the abbreviation need be used afterward. If numerous abbreviations are used, authors should consider providing a list of abbreviations. Also, because of the variable usage of the terms "microevolution" and "macroevolution," authors should clearly define how they are specifically using these terms. Use of the term "creationism" should be avoided. All figures and tables should be cited in the body of the text, and be numbered in the sequential order that they appear in the text (figures and tables are numbered separately with Arabic and Roman numerals, respectively).

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

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

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

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

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

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

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

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

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

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

Special Sections

Letters to the Editor:

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

Editor's Forum:

Occasionally, the editor will invite individuals to submit differing opinions on specific topics relevant to the *Quarterly*. Each author will have opportunity to present a position paper (1500 words), and one response (750 words) to the differing position paper. In all matters, the editor will have final and complete editorial control. Topics for these forums will be solely at the editor's discretion, but suggestions of topics are welcome.

Book Reviews:

All book reviews should be submitted to the book review editor, who will determine the acceptability of each submitted review. Book reviews should be limited to 1000 words. Following the style of reviews printed in this issue, all book reviews should contain the following information: book title, author, publisher, publication date, number of pages, and retail cost. Reviews should endeavor to present the salient points of the book that are relevant to the issues of creation/evolution. Typically, such points are accompanied by the reviewer's analysis of the book's content, clarity, and relevance to the creation issue.

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Creation Research Society

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

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

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

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

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

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

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

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

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