

particularly with regard to origins. Let us shift the creation/evolution debate to more philosophical lines, for at heart the battle is one of prior religious commitments.

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MINISYMPOSIUM ON VARIABLE CONSTANTS—VIII

A CHANGING VARIABLES MODEL FOR THE SPEED OF LIGHT

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Abstract

The speed of light is thought to be a fundamental constant of physics. This paper proposes a model for allowing the speed of light, c , to be changing with time. It is shown that a decaying exponential with the appropriate boundary conditions would accommodate the apparently constant value for c that modern measurements have provided, even if the value of c is changing.

Introduction

Science began when man attempted to systematically catalog repeatable experiences. Collections of observable, repeatable experiments led to the development of scientific models. These models provided a framework for understanding how the bits and pieces of experimental data fit together. A necessary condition for a model to be classified as scientific is that it be falsifiable. A model which is not falsifiable is usually classified as a tautology, whether true or false, and is not classified as a scientific model or theory.

Models can change as new data are gathered. If the new data results in only minor changes to the model, then the model is robust. If the new data requires major changes to the model, or the new data makes the model contradictory, or reliant on secondary assumptions to maintain its integrity, the model becomes weak and probably should be discarded.

Our present model of the speed of light, c , assumes that it is a constant parameter. There is a model which will allow us to consider c as a variable, and still give us a closely constant c at this time in history.

Conditions for Model Revision

Classical physics fails to explain the behavior of very small things (sub-atomic particles) and things which travel very fast (close to the speed of light). Because of this, the classical model was revised to account for high speed phenomena (relativistic mechanics), and further revised to account for very small particles (quantum mechanics). Whether or not

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relativity or quantum mechanics do describe what is really happening, the addition of these two ideas to the original classical model does seem to explain what cannot be explained apart from them. The quantum mechanical and relativistic models, however, are not independent of the classical model. The revised model does not negate the original model. The classical model still holds true for relativistically slow and quantum-rationally large objects.

If classical physics can undergo such a revision in its model, then perhaps our present models based on physical "constants" may be only an approximation of a better model which would use physical "variables" instead of "constants." The new model, however, cannot abandon wholesale, the previous model, just as quantum mechanics and relativity do not abandon classical physics. The revised model would accommodate the constant constants model within the framework of a larger superset called the changing variables model. The changing variables model would approximate to the constant constants model, given the right boundary conditions. Such is the case, for instance with relativity for slow moving objects, and quantum mechanics with large objects. They both approximate to classical physics given the right boundary conditions, i.e., large and slow objects.

The Speed of Light as a Changing Variable

One such parameter which might be variable is the speed of light. If it is changing, then the change is very small. It is so small in fact, that it has evaded our most sensitive instruments. Changes of many orders of magnitude, however, may have occurred in the past. What sort of time relationship satisfies the condi-

tions that the speed of light is barely changing at present, but in the past had very large changes?

Nature seems to prefer exponential time relationships, such as population growth or natural decay of radioactive isotopes. If the speed of light were to follow a decaying exponential, the original speed of light could have been much greater than it is today. If the speed of light is presently at the tail section of a decaying exponential, then any present change with time would be very small compared to the original speed. This decaying exponential model for the speed of light is chosen so that it approaches a constant value in the limit, rather than zero.

Uncertainty of the Speed of Light

As of 1972, the uncertainty in the speed of light was only 1.1 meters per second (Weast, 1975). A change of about one m/s in the last 18 years would be barely detectable. Since no change has been found, assume that the change has only been 0.5 m/s. The following exponential equation defines the model for the speed of light:

$$c(t) = c_0 e^{-t/\tau} + c_{\text{inf}}$$

where

- $c(t)$ = speed of light as a function of time,
- c_0 = original speed of light at creation,
- t = time since creation,
- τ = time constant,
- c_{inf} = speed of light after infinite time.

Since I assumed that the present change in the speed of light is not measurable with modern instruments, a value of 0.5 m/s less than the accepted value 299792456.2 ± 1.1 m/s was used for c_{inf} , i.e., a value of 299792455.7 m/s. Assuming that the size of the universe is 100 billion light years, the time since creation is 10,000 years, and that the time for primal light to reach the earth from the edge of the universe was one day, calculated values for the speed of light, $c(t)$, were obtained as shown in Table I.

Figure 1 shows the speed of light as a function of time using the above model from 6 to 10,000 years after the creation of the universe.

Conclusion

The purpose of this paper was to show whether a changing variables model could be substituted for the presently accepted constant constants model for the speed of light. As shown, it can be done by adjusting

Table I. Speed of light as a function of time since creation.

Time Since Creation [years]	Speed of Light, $c(t)$ [meters/sec]
1	1.094242E+22
1000	6.832396E+19
2000	4.266115E+17
3000	2.663741E+15
4000	1.663257E+13
5000	104150863143
6000	948233447.13
7000	303841289.44
8000	299817736.42
9000	299792613.55
10000	299792456.69

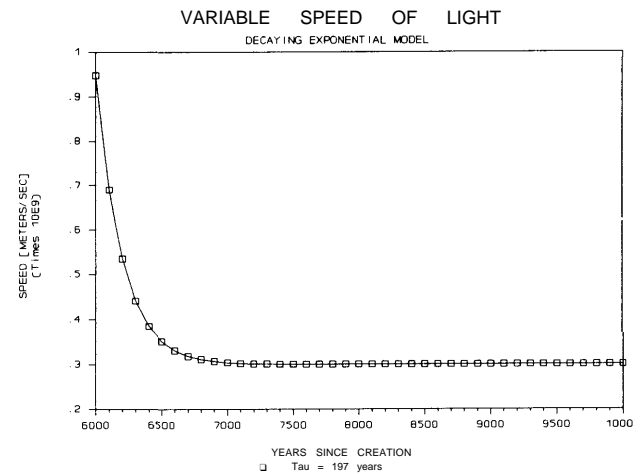


Figure 1. Speed of Light as a Function of Time.

the boundary conditions of a decaying exponential model. There presently seems to be no direct empirical evidence for this model, neither is there any way to refute it, so it does not qualify as a true scientific model. Perhaps one day our instruments will detect a change in the speed of light and revolutionize our way of thinking about physical constants.

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QUOTE

The thesis of the book is far-reaching and can be said to question the basic assumptions of modern life. This thesis can be easily stated: It is the triumph of the doctrine of nominalism as propounded by William of Occam in the latter part of the fourteenth century that put Western man on the wrong path. Such a doctrine had the practical result, Weaver argues.

to banish the reality that is perceived by the intellect and to posit as reality that which is perceived by the sense. With this change in the affirmation of what is real, the whole orientation of culture takes a turn, and we are on the road to modern empiricism. . . . The denial of everything transcending experience means inevitably—though ways are found to hedge on this—the denial of truth. With the denial of objective truth there is no escape from the relativism of “man the measure of all things.” . . . Thus began the “abomination of desolation” appearing today as a feeling of alienation from all fixed truth. . . . Man created in the divine image, the protagonist of a great drama in which his soul was at stake, was replaced by man the wealth-seeking and -consuming animal.

Regnery, Henry. 1988. Richard Weaver: a southern agrarian at the University of Chicago. *Modern Age* 32:105.

BOOK REVIEWS

Twentieth Century In Crisis: Foundations of Totalitarianism by Larry Azar. 1990. Kendall/Hunt. Dubuque, IA. 317 pages. Paperback. \$20.00.

Reviewed by Don B. DeYoung*

Larry Azar is no small-time writer: the book cover carries endorsements from Billy Graham Associates and also from former Education Secretary William Bennett. The author is a conservative philosopher with keen insight on the forces behind history, politics, and sociology. The book especially analyzes the rise of twentieth century totalitarianism during the dark age of Nazism. In this regard Azar makes some startling statements about the negative impact of evolutionary thought on the world. Creationists have been long accused of "seeing an evolutionist behind every tree or problem." In this case, however, Azar carefully supports his critical statements with over 300 references:

The impact of evolution on human thought cannot be exaggerated (p. x).

Darwinian evolution . . . shattered the very foundations of morality itself (p. x).

"I regard Christianity as the most fatal, seductive lie that has ever existed" (a direct quote from Hitler) [p. 155].

This doctrine of racial supremacy Hitler took at face value . . . He accepted evolution much as we today accept Einsteinian relativity (p. 180).

Sixty-three million people would be slaughtered in order to obey the evolutionary doctrine that perishing is a law of nature (p. x).

Azar hammers at length on the impact of evolutionary thinking of Hitler and his henchmen. One section of the text is titled "Hitler's Justification of Racism: Evolution" (p. 179). A strong and serious challenge has been given to modern day evolutionists to refute Azar's analysis.

There was a philosophical foundation in place which made Darwin's ideas immediately successful. Herbert Spencer, Georg Hegel, Thomas Malthus—all played a part. Azar argues that evolution theory of Darwin's day was basically philosophical and biological (p. 55). In fact, the term "evolution" was not used by Darwin in any of the first five editions of *The Origin of Species*, though he was familiar with the word. Nor was the word used in *Descent of Man* or in Lamarck's writings (p. 55). It was philosophers who first popularized the word and applied evolutionary doctrine to their systems of thought. This far-ranging book discusses topics of interest to all. Teleology, or design in the Creation, is discussed under historical philosophy. Examples include geese which fly in V formation at a speed which optimizes energy efficiency (p. 43). Also explained is the mysterious way in which a person produces the correct amount of adrenalin for unexpected situations. Too much would be dangerous; too little would be useless. Where did the adrenal gland learn arithmetic, asks Azar (p. 45)? Aside from teleology, Azar is equally comfortable discussing nu-

clear energy: We have become nuclear giants and ethical infants (p. 228), abortion (p. 82) and child abuse: More brain damage is being effected through child abuse than through cerebral palsy (p. 294). This book provides excellent study for the armchair philosopher. It is also a useful supplement for conservative philosophy courses.

The Long War Against God by Henry M. Morris. 1989. Baker Book House, Grand Rapids. 344 pages. \$21.95.

Reviewed by Clifford L. Lillo*

In his Foreword, David Jeremiah says, "*The Long War Against God* is the most comprehensive treatment of a single important subject that I have ever seen" (p. 10). The subject is war and Morris does not mince words in describing the nature of the war against God and in identifying the participants. The war is between creationists and evolutionists.

The idea that a loving, wise, and powerful God used evolution—with its "struggle for existence" and "survival of the fittest"—as his method of creation is grotesque! (p. 58)

The fiction that evolution has been proved scientifically to be true, is false! It is simply a belief system, devised for political or religious reasons (p. 90).

Who is the enemy in this war? Under the heading of "Evangelical Compromise" Morris says,

Many orthodox, Bible-believing Christians might note at this point that the main-line churches and seminaries, controlled as they are by liberals, are filled with significant numbers of "unsaved" members, people who profess to be Christians but have never truly been "born again" through personal faith in the saving work of Christ (p. 101).

The concept that Christian leaders in churches and seminaries are actual enemies of God may cause gasps of astonishment and disbelief, but readers should let Morris provide the rationale for his claim. He says,

The greatest tragedy involved in trying to compromise Scripture with evolution, of course, is that evangelical thereby are denying the very Word of God. Even the secularists can see this (p. 109).

He then quotes A. J. Mattell, Jr.,

. . . Many Christians have taken the dishonest way of lengthening the days into millions of years, but the creationists make it clear that such an approach is nothing but a makeshift that is unacceptable Biblically and scientifically (p. 109).

Who are the other enemies? Morris says, "The logical and almost inevitable end result of evolutionism is atheism" (p. 109). He hastens to add, "Not all evolutionists are atheists, but evolution itself is atheistic, for the simple reason that its very purpose is to

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explain things without God" (p. 110). Along this line he also says,

An even more compelling reason for equating evolutionism with atheism, however, is its essential inconsistency with the character of God and his incarnate Son, the Lord Jesus Christ (p. 112).

To clarify, Morris adds, "Not all evolutionists are humanists or atheists, by any means, but all humanists and atheists are evolutionists!" (p. 117)

In reality, many evolutionists admit that the theory of evolution did not begin with Darwin. Morris says,

Darwin's great contribution to science was really quite trivial, as well as false. He neither originated nor proved his claim that natural selection could generate even one new species . . . (p. 160)

The war being fought is a war against God and creationists have many enemies. Readers will find much ammunition for the war in this book.

Wonderful Life: The Burgess Shale and the Nature of History by Steven J. Gould. 1989. W. W. Norton. 347 pages. \$19.95.

Reviewed by Micheal J. Oard*

Steven Jay Gould professes a rather unreasonable dislike for creationists in his publications. But he also manages at times to pluck some sacrosanct plums from the evolutionary tree. In this book the plums are the shoehorn of certain evolutionary models based on preconceived beliefs, the Victorian idea of regress in the fossil record, the evolutionary bush of life, and the predictability of evolutionary progression. Whatever we creationists think of Gould, we must give him credit for his attempt to set the record straight on some long-held turf of evolutionary thought.

The book is purported to be a popular account of the discovery and reanalysis of the Burgess Shale fauna. But as with most of Gould's books, a dictionary is helpful. Biblical metaphors such as Armageddon are rather common. The book title was derived from an old Jimmy Stewart movie in which an angel replays the main character's past life without him to show how he has positively influenced others.

Gould's setting is the classic middle Cambrian Burgess Shale, 8,000 feet high near the top of a mountain in southeastern British Columbia. The main sedimentary deposit is only about eight feet thick and a city block long, but an amazing variety of animals have been discovered. The fauna were supposedly buried in a "turbidity current" or mudflow in an anoxic basin because the fauna show abundant signs of being buried rapidly. In the book, no sedimentary evidence for a mudflow origin was presented. If true, the mass flow must have been extremely gentle. Contrary evidence for this interpretation can be construed from the lack of juveniles, and the fact that most organisms are lying in their most stable hydrodynamic positions.

The story begins with the self-taught former head of the Smithsonian Institution. Charles Doolittle Walcott, who discovered the Burgess Shale. Due partly to

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burdensome administrative duties, but mostly to preconceived ideas about evolution, Wolcott pigeonholed the Burgess fauna within existing phyla of the Cambrian Period of geological time:

Walcott proceeded to misinterpret these fossils in a comprehensive and thoroughly consistent manner arising directly from his conventional view of life: In short, he shoehorned every last Burgess animal into a modern group, viewing the fauna collective as a set of primitive or ancestral versions of later, improved forms (p. 24).

Walcott's model was simply "increasing complexity and diversity with time." The standard evolutionary iconography of these concepts are a ladder and a bush. These images portrayed in thousands of textbooks are painted on the minds of both scientists and laymen. As will be shown, the Burgess fossils in no way support such a notion. Gould has exposed only the tip of the iceberg of evolutionary thought. Historical science is replete with examples of almost blind model-fitting. The classic four-ice-age model is but one example of this "reinforcement syndrome" (Oard, 1985, p. 178-79).

A substantial portion of Gould's book describes the painstaking reanalysis of the Burgess Shale fauna by Harry Whittington, Simon Conway Morris, and Derek Briggs at Cambridge University. Although the descriptions are rather detailed, Gould does his best to enliven the new discoveries. Whittington restudied the Burgess fauna by using a procedure of systematically peeling back the thin exoskeleton of each creature, revealing the form of the gills, and then peeling back the gill layer to reveal the legs or the bottom of the organism.

In chronological order Gould unfolds the drama of discovery of these weird soft-bodied creatures. *Opa-binia* has five eyes, first described as an arthropod and very suggestive of an annelidan ancestor by Wolcott, but reclassified as almost totally unique by Whittington. One-inch long *Hallucigenia* is an animal in which it is very difficult to tell the front from the back, and which side is up. *Wiwaxia* looks like an artichoke with long vertical spines. The fossilized "jellyfish" from the Burgess Shale, originally described by Wolcott, turned out to be the mouthpiece of a two-foot long carnivorous animal, appropriately named *Anomalocaris*. Gould stresses the significance of this science-fiction-like creature:

I could not have made up a better story to illustrate the power and extent of the Burgess revision than the actual chronicle of *Anomalocaris*—a tale of humor, error, struggle, frustration, and more error, culminating in an extraordinary resolution that brought together bits and pieces of three "phyla" in a single reconstructed creature, the largest and fiercest of Cambrian organisms (p. 194).

About 20 wonders from the Burgess shale have been described in the scientific literature, and this is only one-half of the truly unique creatures present. These animals were not isolated, but were found among the standard fossils from the Cambrian, such as trilobites, brachiopods, corals, sponges, algae, echinoderms, and mollusks. Recently, other Burgess-like animals have been found in other layers near the Burgess Shale and other parts of the world.

The significance of the Burgess Shale fauna is that all of these unique creatures suddenly appeared out of nowhere and practically all of them subsequently became extinct. The creatures are so unique that most of them can probably be classified as distinct phyla:

In a geological moment near the beginning of the Cambrian, nearly all modern phyla made their first appearance, along with an even greater array of anatomical experiments that did not survive very long thereafter (p. 64) . . . The Burgess Shale includes a range of disparity in anatomical design never again equaled, and not matched today by all the creatures in all the world's oceans (p. 208).

The Cambrian explosion has become the Cambrian "big bang." The evolutionary bush of life has been turned upside down. It is like a Christmas tree with the trunk cut off. Although there are many more species living today, there were many more "phyla" in the Cambrian than now.

Gould only briefly attempts to explain this sudden great complexity in the Cambrian era. He essentially dismisses the Ediacara and Tommotian fauna of late Precambrian or very early Cambrian as being precursors to the Cambrian. He admits that Darwin's "favorite ploy" of the imperfection of the fossil record is hollow indeed, now that we know much more about the glaring discontinuity:

Step way way back, blur the details, and you may want to read this sequence as a tale of predictable progress: prokaryotes first, then eukaryotes, then multicellular life. But scrutinize the particulars and the comforting story collapses (p. 60).

Many scientists have summarily dismissed this glaring inconsistency with evolutionary theory. Gould barely mentions the "acquisition of hard parts" hypothesis, which is often invoked. Few evolutionists have squarely faced the Cambrian explosion, not to mention the new Cambrian "big bang" and other large gaps in the fossil record. Evolutionist Rudwick (1963, p. 150-55) points out the likely reason why this long-standing great discontinuity has been minimized:

Many recent authors have avoided the full force of the problem by underrating the magnitude of the contrast. An evident anxiety to preclude any causes of an extra-scientific or even extra-terrestrial nature has led them to underestimate both the sudden appearance and the "advanced" character of the Cambrian fauna . . . The problem must therefore be accepted as real; the evidence must be explained, and not merely explained away . . . The scarcity of infra-Cambrian [late Precambrian] trace-fossils suggests that the origin of the Cambrian fauna involved more than the mere acquisition of preservable skeletal structures . . .

Gould further points out that the picture of evolution painted by the Burgess Shale is not one of progress, similar to the Victorian idea that gave impetus to the theory of evolution. The picture is one of explosive diversity followed by decimation. The history of life is *not* one of increasing complexity at all. The Burgess fauna is already incredibly complex and specialized,

not simple and general. And this Burgess pattern is repeated with conventional groups of fossils with hard parts, according to Gould. The reader may wonder why, if evolution was so volatile at the beginning, do we not see a similar pattern at many other later periods of geological time. Gould attempts to answer this question, but unsatisfactorily.

Since evolution is supposedly due to random genetic mutations, and natural selection is blind to the needs of the organism, Gould states that the current panoply of life is just one of many evolutionary possibilities from the Cambrian period. Gould uses the illustration of rewinding the "tape of life" back to the Cambrian and replaying the evolutionary drama. It is doubtful that anything like the present fauna would result. Human beings very likely would not exist. "Replay the tape a million times from a Burgess beginning, and I doubt that anything like *Homo sapiens* would ever evolve again" (p. 289). Gould admits that it seems impossible to predict which Burgess phyla would flourish and which ones would meet the grim reaper. What does the "tape of life" idea have to say about the evolutionary concept of parallel or convergent evolution, which Gould affirms as a principle of evolution in this book? Gould apparently cannot see the contradiction between the "tape of life" and parallel evolution.

The "tape of life" metaphor drives the futility of human life down another notch. Gould recalls past defeats to human worth:

But, as Freud observed, our relationship with science must be paradoxical because we are forced to pay an almost intolerable price for each major gain in knowledge and power—the psychological cost of progressive dethronement from the center of things, and increasing marginality in an uncaring universe. Thus, physics and astronomy relegated our world to a corner of the cosmos, and biology shifted our status from a simulacrum [image] of God to a naked, upright ape.

To this comic redefinition, my profession contributed its own special shock—geology's most frightening fact, we might say. By the turn of the last century, we knew that the earth had endured for millions of years, and that human existence occupied but the last geological millimicrosecond of this history—the last inch of the cosmic mile, or the last second of the geological year, in our standard pedagogical metaphors (p. 44).

To this delightful picture of human existence, we now must add that we were not even destined to evolve according to Gould:

Homo sapiens, I fear, is a "thing so small" in a vast universe, a wildly improbable evolutionary event well within the realm of contingency. Make of such a conclusion what you will. Some find the prospect depressing; I have always regarded it as exhilarating, and a source of both freedom and consequent moral responsibility (p. 291).

At the end of the book Gould muses about the "fact" of evolution. Gould states why he believes evolution is a fact:

We know that evolution must underlie the order of life because no other explanation can coordinate the disparate data of embryology, biogeography, the fossil record, vestigial organs, taxonomic relationships, and so on (p. 282).

This list is rather amusing since much evidence can be garnered to show that the interpretations of each piece of this data are at best equivocal. By embryology Gould must not mean the discarded "fundamental biogenetic law" of Ernst Haeckel, but something akin to the comparative anatomy of embryos—the idea that taxonomic relationships imply descent from a common ancestor. Creationists know that this "proof" of evolution can just as well be considered as showing similar designs by God for organisms that live in similar environments. We also do not have to explain away the thousands of exceptions to the evolutionary rule that "similarity implies descent." The vestigial organs on the list is surprising, since the more we know about science, the fewer vestigial organs remain. Of course Gould is well aware of the huge systematic gaps in the fossil record, which is the "trade secret of paleontologists." This in itself should falsify evolution to an open-minded person. There are many unknowns in biogeography, including questions as to what exactly is a species and differing interpretation of the data. Many creation scientists were once evolutionists and are not only familiar with this data, but also have examined both sides of the controversy. It is doubtful many evolutionists have examined both sides. Gould, like Walcott, has shoehorned the data into preconceived evolutionary pigeonholes. It is too bad he cannot see this; he would have abundant data for many more books.

Finally, Gould tries to lift historical science up to a par with the experimental sciences, like physics;

But historical science is not worse, more restricted, or less capable of achieving firm conclusions because experiment, prediction, and subsumption under invariant laws of nature do not represent its usual working methods (p. 279).

Without the strict use of the scientific method, historical science is vulnerable to a host of assumptions that are usually difficult to verify and which depend on other assumptions. In reading Gould's appeal for scientific credibility, I recall W. R. Thompson's words in the introduction to a republished edition of Darwin's *The Origin of Species* (Thompson, 1956, p. xxiv):

This general tendency to eliminate, by means of unverifiable speculations, the limits of the categories Nature presents to us, is the inheritance of biology from *The Origin of Species*. To establish the continuity required by theory, historical arguments are invoked, even though historical evidence is lacking. Thus are engendered those fragile towers of hypotheses based on hypotheses, where fact and fiction intermingle in an inextricable confusion.

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LETTERS TO THE EDITOR

Ichnofossils Exposed to the Elements

In reading the reports of Rosnau *et al.* (1989a; 1989b) concerning quasihuman, quasimammalian and dinosaur ichnofossils in the Kayenta formation near Tuba City, Arizona, a thought comes to mind. If these surface ichnofossils are indeed animal footprints, it appears that the formation in which they are located is quite young. It seems unlikely that these prints exposed to erosion, spalling and weathering could have survived for millions of years. Is this not a reasonable conclusion? Would Howe or Waisgerber care to comment on this observation?

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1989b.

Are human and mammal tracks found together with the tracks of dinosaurs in the Kayenta of Arizona? Part 11: A field study of quasihuman, quasimammalian and dinosaur ichnofossils near Tuba City. *CRSQ* 26:77-99.

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Reply to Williams

Emmett L. Williams' conclusion regarding a probable young age for the Mesozoic Kayenta Formation, near Tuba City, Arizona is plausible because it could answer an enigma of which I have been aware for some time. The enigma concerns itself with how river systems in North America developed in varied rock formations of varied ages, in accordance with evolutionary geologic time.

For northern Arizona, in times past, the Grand Canyon of the Colorado River may have been created in less time than is generally believed. This would be due in part to greater erodibility over a short term within the Colorado River region. Greater erodibility in times past would have required (1) greater volumes of water in the river and its tributaries and/or (2) rock formations which were less consolidated and/or less cemented than each formation is today.

Regardless of the depositional history of a formation, it is axiomatic that any elastic formation such as the Kayenta Formation will be less consolidated and less cemented immediately after initial deposition than it would be at a later time. Hence the formation would be susceptible to greater erosion potential immediately after deposition than later.

Dr. Williams' suggestion that erosion of a terrain over millions of years would have resulted in removal of footsteps is definitely plausible. Time applied to a chemical or physical equation results in answers which will vary with the length of that time.

The relationship of erosion of formations to existing geomorphic conditions should be studied objectively by creationists. Study the properties of water, then apply those properties to evolutionary time and evolutionary formations. You will find enigmas cropping out everywhere.

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Moon Dust

A recent book by Isaac Asimov (1989) includes the author's first science essay published in 1958 which predicted the possibility that a spaceship landing on the moon would sink into a pile of meteoric dust 50 feet deep:

But what about the Moon? It travels through space with us and although it is smaller and has a weaker gravity, it, too, should sweep up a respectable quantity of micro-meteors.

To be sure, the Moon has no atmosphere to friction the micro-meteors to dust, but the act of striking the Moon's surface should develop enough heat to do the job.

Now it is already known, from a variety of evidence, that the Moon (or at least the level lowlands) is covered with a layer of dust. No one, however, knows for sure how thick this dust may be.

It strikes me that if this dust is the dust of falling micro-meteors, the thickness may be great. On the Moon there are no oceans to swallow the dust, no winds to disturb it, or life forms to mess it up generally, one way or another. The dust that forms must just lie there, and if the Moon gets anything like Earth's supply, it could be dozens of feet thick. In fact, the dust that strikes crater walls quite probably rolls down hill and collects at the bottom, forming drifts that could be 50 feet deep, or more. Why not?

I get a picture, therefore, of the first spaceship, picking out a nice level place for landing purposes, coming slowly downward tail-first and sinking majestically out of sight (Asimov, pp. xvi-xvii).

NASA's failure to find large dust piles on the moon's surface is not attributed by Asimov to the young age of the earth but to the lack of oxygen atoms keeping the dust particles apart:

Finally, the landing on the Moon, eleven years after I wrote this essay, really knocked out the matter of thick layers of dust on the Moon. That notion had been advanced by Thomas Gold and it was plausible (or I wouldn't have fallen for it) but it was wrong. The thing is that the dust on the Moon is accumulating in a vacuum. In air,

oxygen atoms layer the surface and keep the dust particles apart. In vacuum, the dust particles stick together so that the surface is something like crunchy snow. But you can't win them all (Asimov, p. xvii).

A simple measurement will suffice to show how silly his explanation is. I have in my stock room a bottle of iron powder. Five cm³ of this powder weigh 15.41 grams, yielding a density of 3.1 g/cm³. A solid chunk of iron only has a density of 7.9 g/cm³. Therefore, Asimov's 50 feet of dust, if turned into a solid crust would still have a depth of almost 20 feet!

Reference

Asimov, Isaac. 1989. *Asimov on science, a 30-year retrospective*. Doubleday, Garden City, NY.

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St. Augustine and Genesis

Theistic evolutionists often use Augustine's name to support their non-literal interpretation of Genesis, but in fact he was very far from agreeing with their theories:

1. In direct contrast to those who wish to stretch out the six creation days into 4.5 billion years, Augustine thought six days an unnecessarily long time for God to take. So he resorted to Ecclesiasticus 18.1 (Greek) as his proof text, misunderstood the word 'koinei' ('in general'), and came up with the wrong translation: "He created all things simultaneously" (Augustine, p. 325). He then tried to squeeze the six days into 'no time,' with a host of philosophical reasons.
2. Augustine certainly accepted Adam-and-Eve as literal history; he expresses no idea of God breathing 'spiritual' life into some kind of animal.
3. He argues, exactly as modern creationists do, that the God who turned water into wine, and Moses' rod into a serpent, instantaneously, does not need time to make man or any other creature.
4. Turning to his *City of God* we find that he accepted Noah's Flood as universal and a fact (Book XV, Chapter 27) and the heading to (Book XII, Chapter 10) is "Of The Falseness Of The History Which Allots Many Thousand Years To The World's Past" (Augustine, p. 340). He continues:

Let us omit the conjectures of men who know not what they say, when they speak of the nature and origin of the human race . . . they are deceived by those highly mendacious documents which profess to give the history of many thousand years, though, reckoning by the sacred writings we find that not 6000 years have yet passed (Augustine, p. 348).

5. Augustine insists that the ages of the Patriarchs are literally true and constitute a chronology (Book XV, Chapters 9-15).
6. Admittedly he did believe that thorns and thistles were part of the original creation, and evolutionists

can extract a crumb of comfort from this. But, by and large, there is no doubt that Augustine was a 'literalist' and a Young-Earth creationist.

Reference

Augustine. 1952. *City of God in Hutchins, R. M. (editor). Great books of the western world. Volume 18. Encyclopedia Britannica. Chicago.*

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QUOTE

A moderate-sized protein may have 150 amino acids; the possible combinations of the 20 kinds in such a molecule are 10^{195} . This is a very large number; if the amino acid sequences in a prebiotic protein were generated by random processes, we could never hope to produce an given protein of this length on earth. It is estimated that there are about 10^{22} stars in the known universe. If each of these stars had a planet on which prebiotic syntheses were producing one billion different 150-amino acid proteins per second for five billion years, about 7.8×10^{25} combinations of amino acids would be produced—billions upon billions short of the total possible combinations. The likelihood of discovering a particular 150-amino acid combination by chance would still be miniscule. On earth we had only a billion years or less from the origin of the planet to the origin of life. We must conclude either that the particular proteins that exist on earth did not arise by random process, or that many amino acid sequences will lead to proteins having biologically interesting properties, so that the ones that happened to have appeared represent only one [sic? a few?] out of many millions of possible protein sets that could form the basis of living beings.

Ayala, Francisco J. and James W. Valentine. 1979. *Evolving, the Theory and Processes of Organic Evolution*. Benjamin/Cummings. Menlo Park, CA. p. 340.

The information is not new but the dilemma is both freshly and well stated. Interestingly, the authors opt for the first possibility in an ingenious scenario (p. 341) that they admit is speculative and try to show how proteins did not arise by random processes. They suggest "natural templates" such as clay minerals may have controlled the ordering of the amino acids! Oh well, give them a point for at least admitting the idea is no more than rank speculation. . . . An alternative presumably would be an early association of nucleic acid with amino acids—but this leads to the chicken-egg problem because nucleotide sequences can be translated into protein synthesis only when mediated with enzymes, themselves proteins. So which came first? DNA or protein? Although Stanley Miller's experiments provided a way for demonstrating synthesis of amino acids—there has been no synthesis of nucleotides. "The prebiotic synthesis of nucleotides has not yet been accomplished and this remains a problem. (p. 339).

John N. Moore

The Results of Science and Technology?

Paulding's distrust of fashion, progress—the whole complex of modern life—is never more evident than in the curious and revealing fantasy which he inserted in *Letters from the South*. The narrator has a dream in which he visits a strange land of the future, the "Isles of Engines." In the Engine Isles human life has been largely mechanized and all work formerly done by hand is now done by machines. The narrator encounters toothpick-making machines, steam corkscrews, steam grave diggers and steam washers. Not only have machines replaced manual labor, but machine-made men are rapidly replacing "anatomical men." Anatomical men are being taught to starve scientifically and to give technical explanations for their weakened condition. So desperate have things become that the machines, no longer content with eliminating people, have begun to eliminate each other. Railroads have replaced the canals and steamboats are fast replacing the railroad. Magnetic boats that travel a thousand miles per hour are fast replacing the steamboat. Every trace of intellectual or social life has disappeared. At the nearby Republic of Elsewhere—a thinly disguised England—the dreamer attends a "lecture" in the university town of Oxhorn. The lecture is on the evolution of bottle opening from the fingernails to the steamscrew. A concert of steam instruments terminates abruptly when one of the boilers explodes and nearly demolishes the audience. Those in the audience who survive are completely indifferent to the suffering of those around them. When the dreamer uses the word "courteous," he is told that such expressions have become "obsolete." The dreamer awakens as he is about to have his "boiler" patched. (Taylor, 1969, p. 241)

Reference

Taylor, W. R. 1969. *Cavalier and Yankee: The Old South and American National Character*. Harper and Row. New York.

QUOTE

A Swedish writer, Tage Lindbom, assesses the consequences of the Modernity that has prevailed since the Second World War:

We have now to deal with a secularized generation for which material existence is everything and spiritual life is nothing. It is a generation for which all that is symbolic becomes ever more incomprehensible. It is a generation which no longer lives in a viable society, but in an institutionalized world where state, administrative, and industrial apparatuses raise themselves in front of the human person like an enormous pyramid. It is a generation which is in the process of eliminating from its consciousness the notion of the family. . . . It is now an affair of a generation which, in its ensemble, is incapable of discerning truth from lies, the true from the false, the good from the bad. The time of harvest is come for the Kingdom of Man.

Kirk, Russell. 1987. *Obdurate adversaries of modernity. Modern Age. 31:206.*