ISOTOPE RATIOS AND VARIABLE CONSTANTS**

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Abstract

Evidences and possible mechanisms for variable nuclear halflives are explored. The basis for the definition of physical constants is examined.

Feedback Mechanism

The uncertainty of past rates of radioactive decay suggests the need for a rethinking of today's physical theories, especially the controversy between ether theories and the atomistic approach to matter and fields. By this I refer to the different mental concepts or pictures of fields possessing wave characteristics and the quanta or particles which compose the field. I think that there are attractive arguments on both sides of this controversy. The implications of the experiments of Alain Aspect performed in Paris (Fry, 1984), which show the reality of non-local correlations, do not seem to have been fully explored in this context. This is important because it shows that radiation phenomena, and in particular radioactivity, are not "one-way-street" schemes. They are in reality feedback schemes. This means that mother and daughter nuclides are still in connection after separation and that the energy aspects involved may play a part also. Further it seems to say that radioactivity is "coordinated," not simply a "stochastic" or "random" process, but embedded in a larger structured, energetic environment. This aspect may hold some surprise in the future for the problem of accelerated, historical radioactive decay.

Variable Radioactive Decay

The creationist models for variable radioactive decay so far offered include: variance of permittivity, permeability, and a strong perturbation of the nucleus. It is known that some isomers remain in an excited state for a fairly long time, and that while in the excited state they have different decay rates for the alpha decay mode, for instance certain Polonium isotopes such as Po-212. It is well known that many alpha-emitters end in several distinct energy levels. The "alpha-branching ratios" show the different energies of emission involved. This implies that an alpha emitter decays under different half-lives (partial half-life) simultaneously. The half-life is the time that would be required for one half of an initial number of radioactive atoms to decay. A partial half-life is based on the fraction of the total number of atoms that decay *in a given mode* per unit time. For instance, U-238 decays with two different alpha decay modes: 4.182 MeV (million electron volts) radiation with 77% of the decaying U-238 nuclides involved and 4.135 MeV with 23% of the decaying U-238 nuclides involved. Likewise, U-234, a later daughter of U-238, decays according to six different energy levels of alpha particles and therefore six different partial half-lives: 4.768, 4.717, and 4.60 MeV (and three further levels of very low percentage). The percentages corresponding to these levels are about 72%, 28%, and 0.3% It is evident that U-238 and U-234 can emit alpha particles with different partial half-lives or energy levels. Pu-238, seemingly a very similar nuclide to U-238, has a half-life of less than 90 years, while U-238 is about 4.5 billion years. Both are even-even nuclides (that is, the numbers of both protons and neutrons are even) but differ enormously in their half-lives. The Pu-238 has two extra protons and hence extra Coulomb repulsion inside the nucleus. But the extra Coulomb energy is a small fraction of the nuclear binding energy. Hence this example shows that a very small change in permittivity, permeability, or some other parameter may drastically change the half-life of U-238 and U-234 also. The energy level structure of the nucleus changes with the Coulomb field. Hence a change of the order of a thousand electron volts can result in significant change in half-lives due to the shift in relative importance of these different decay modes.

Concepts concerning the theory of alpha decay were already worked out in the first half of this century, for instance by E. C. Kemble (1937) and F. Rasetti (1936). Time dependent wave functions were constructed for the emission of alpha particles, together with the Coulomb force and other parameters involved. References for the above partial half lives, energy levels and further work on alpha decay may be found in Preston (1975).

Tunneling Effects

One must not overlook the possibility that there may exist appropriate mechanisms which couple to "tunneling" effects or to the fields of neutrinos or other exotic particles. But certain facts must be taken into account; for example the existence of the same isotope ratios (U-238:U-235 = 137.8:1, approximately) in moon rocks and earth rocks. The fact that these isotope ratios are the same indicates that if the decay rates varied, the change occurred in the same manner on the moon as on the earth. The effect of such variations on the diameters of Gentry's halos (Gentry 1988) is not an obstacle. It is mainly the later very short lived daughter nuclei that shape the halo, since the later decays have higher energy. Also, the time of increased decay rates may have been during the Genesis Flood, and halos may not have been produced at that time. The time of the Flood would seem likely since it was a time of judgment and destruction, hence also decay. For example, in Deuteronomy 8:4 and 29:5 God reminded the people that in the desert their shoes or sandals as well as their clothes did not decay. So decay is connected with destruction and judgment. Genetically related isotopes are isotopes for which one decays into an-

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**Editor's Note: Readers interested in the subject of variable constants should consult the following articles in the minisymposium on that topic: *CRSQ* 26:121-131; 27:6-15, 60-72, 98-105. A complete list of references is included in many of the papers.

other. Experiments show that the separation of genetically related uranium isotopes on passage into solution is not dependent on uranium oxidation but is only a consequence of excess recoil atoms in metamict minerals. Metamict minerals are radioactive minerals exhibiting lattice destruction due to radiation damage while the original external morphology is retained. When radioactive atoms decay the parent nucleus recoils, so in metamict minerals there will consequently be many sites where recoil nuclei have been deposited. Because U-234 is preferentially leached in rocks, this provides evidence that U-234 decayed within these rocks (Chalov and Merkulova, 1968). To achieve the radioactive equilibrium between U-238 and U-234 observed in closed systems today would take about 6 to 10 half lives of the shorter lived U-234, that is, 6 to 10 times 245,000 years. This indicates to a young earth creationist that decay rates may well have varied.

Variable Constants

I conclude that most "constants" are not constant at all. This includes the gravitational constant, permittivity, permeability, and Planck's constant. The notion that these are "constants" seems to be a product of the misunderstanding of the underlying facts. Therefore, Dirac's and van Flandern's suggestions that the gravitational constant may have varied with the passage of time are not necessary. By this I mean that theories such as Dirac's (1973) could turn out to be wrong and there could still be a basis for variable constants. There seems to be much confusion about permittivity and permeability. Let it be understood that it was James Clerk Maxwell himself who invented these "constants" solely to give his equations symmetry with respect to magnetism and electricity. It seems to be forgotten that Maxwell's equations are nothing but definition-equations, somewhat similar to Einstein's definition of the velocity of light in his equations as a constant and the maximum possible speed. Maxwell further assumed the time-independence of both of the "constants" he invented, namely the dielectric constant defining permittivity and the magnetic constant defining permeability of the vacuum. According to modern physics the vacuum is not a void but is filled with virtual particles. Maxwell introduced these defining equations to explain his ether concept that conformed to the wave equation. Maxwell required that either

$$\varepsilon_0 = 1 \quad \mu_0 = c^{-2}, \text{ or } \mu_0 = 1 \quad \varepsilon_0 = c^{-2}$$

Here ε_0 is the permittivity of free space, μ_0 is the permeability of free space, and c is the speed of light in vacuum.

Nobody knows what the dielectric constant defining permittivity, or the constant of permeability *are* in reality, i.e. what their underlying nature is, independent of Maxwell's equations. The only thing we know is how both perform in a *medium,* nothing more. The reference frame for these constants, the vacuum, is also a medium. But even there the meaning is only by definition, not what these constants are in reality. Further, it can be shown that the permeability of free space is a velocity dependent quantity in the Maxwell equations.

Similar arguments show that all other natural constants are not really inherent constants, but were made by arbitrary selection, for instance, Planck's "h" and the gravitational constant.

Accelerated Neutron Fluxes

Melvin A. Cook long ago reported findings concerning fast neutrons in Uranium/lead ores (Cook 1966, 1968). The neutron flux must have been a *million* times larger than at present. Cook did not find an answer as to where the many neutrons came from to explain his lead ratio models. It can be said with confidence, however, that Cook's ratios *demand* accelerated decay in the past. Cook gave many convincing calculations that can only be explained by an extremely high flux of fast neutrons in the past in these ores. These abnormally high neutron fluences (fluence is the integration over time of the total neutron flux) are found mainly in uranium ores. Interestingly, xenon, gadolinium, krypton, etc. may have also been affected according to Kuroda's isotope models (1982). This provides evidence that the fast neutrons were produced by much faster decay rates (of U-235 and U-238 for instance) in the past. A further fact to be considered is that faster decay rates in the past would have to decelerate in such a manner that equilibrium between mother and daughter could be achieved in a short time span, i.e. within the approximate 4500 years since the Flood. Today's values for half-lives are 4.468 billion years and 245 thousand years for U-238 and U-234. The past, faster decay rates had to remain in such a mutual relation (U-238/U-234) that U-234 decay had enough time (4500 years) to establish radioactive equilibrium between these nuclides by the present date, in closed mineral systems. That is, the present day isotope ratio of U-234 to U-238 is about 1 to 20,000, and the half-life ratio of U-234 to U-238 would have to vary in such a way that this final abundance ratio would result. It is not easy to construct such a mechanism for reducing the decay rate in this way. But I think that the problem can finally be solved. Perhaps a smooth fading of a varying vacuum energy or some similar possibility should be investigated.

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DIVIDING THE EARTH*

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Abstract

A new theory of continental separation is introduced in which it is advocated that rapid division of a proto-continent occurred by the impact of a giant meteorite east of what is now called Tanzania.

Introduction

If we pass by a car whose front end is crushed against a bridge abutment, with skid marks behind the wheels, we assume we are observing the result of a high-speed collision. If someone were to say that the car had slowly inched its way into the abutment over a period of months, and continued to move forward imperceptibly even now, we would probably laugh. Yet this way of thinking is foundational to current continental drift theories. There are good reasons to believe that the continents suffered the same fate as our crashed car. In this article I will present the case for rapid continental separation and mountain building as a result of a giant meteorite impact, and will propose a specific location for the impact.***

Meteorite impact theories that postulate global climate changes, mass extinctions, and even some localized acceleration of continental drift (Hartnady, 1986, p. 426; Northrup, 1987, pp. 126-127), are in vogue. However, I take the idea one or two levels of magnitude higher.

Forces of Continental Movement

The difference, of course, between cars and continents in motion is that we are used to seeing cars moving at high speeds, whereas continents appear to be stationary, and indeed were long thought to be unmoved since their origin, though subject to reformational forces over time (Skinner, 1986, p. 406). Even when evidence for plate motion became generally accepted, it was made to fit the gradualistic concepts of uniformitarianism. But creationists have no stake in invoking gradual change over hundreds of millions of years the way evolutionists and other uniformitarian geologists do. Special creation, a catastrophic Flood, a catastrophic division of the surface of the Earth—all are acceptable intellectually within the time frame of Genesis, provided the evidence is there. What evidence is there for an impact?

Globally, lateral compression appears to have been critical to the raising of mountain ranges. Whether they are Andean-type or collisional mountain ranges (Keary and Vine, 1990, p. 180), and whatever maybe the complicating factors in the process (Artyushkov, et al., 1980, pp. 44-45; Keary and Vine, 1990, pp. 186-188; Miyashiro, et al., 1982, p. 95), at this stage in our understanding of orogeny it seems clear that

> evidence of vertical motions is abundant in the geological record, but it cannot explain certain features—especially the existence of mountain ranges, for which lateral forces seem to be required. Geological mapping in ranges such as the Alps reveals evidence of large-scale lateral compression. Once-flat strata can be seen to be folded and thrust sideways. Vertical motions alone cannot build mountains (Skinner, 1986, p. 406).

Assuming that the lateral compression resulted from the movement of the land masses against an unyielding ocean floor or against other land masses, lateral compression would occur along the leading edge of the moving land masses, the front end of our crash car.

If the compressed side of a land mass was the leading edge during movement, then we should be able to trace its path of travel back from the trailing edge. On the trailing side of the land masses, the direction of movement is shown by the position of mid-ocean ridges and the lines of transform faults. Between each land mass and its point of origin should be an oceanic rift perpendicular to the direction the land mass moved. An experiment conducted by Oldenburg and Brune of the University of California at La Jolla in the early 1970's produced the patterns seen at and on either side of the mid-ocean ridges on the ocean floor. A fan cooled a pan of molten paraffin as a paddle embedded in the middle of the paraffin was drawn toward one edge of the pan. The paraffin formed the ridge and transform fault pattern characteristic of mid-ocean rifts (Sullivan, 1974, p. 115). Note that the rift zone is where the oceanic crust has been *pulled* apart, presumably by the moving land masses. Material welling up in the rift valley did not *push* the oceanic floor apart. In each case it is apparent that North and South America, Antarctica, Australia, and India travelled in essentially straight lines to the positions they occupy today.

Since we can determine the direction of movement, Figure 1, we can trace the land masses back to their pre-separation positions. Note that the direction arrows emanate from a single point in the vicinity of the Aldabra Islands. It is at this point, the only point from which all the moving continents fled, that we find a very large crater-like feature.

Dr. William F. Haxby of the Lamont-Doherty Geological Observatory has produced extraordinary maps of the ocean floor by using data recorded by the SEASAT altimeter, which measured variations in ocean surface levels (Canby, 1983, pp. 282-283). Haxby's maps turn out to be more revealing than standard ship-gathered bathymetric maps because they "see

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***Readers interested in this topic may wish to consult other *CRSQ* articles on the subject: Unfred, D. W. 1984. Asteroidal impacts and the Flood-Judgment *CRSQ* 21:82-87; 1986. Flood and post-Flood geodynamics–an expanded earth model. *CRSQ* 22:171-179; Parks, W. S. 1990. The role of meteorites in a creationist cosmology. *CRSQ* 26:144-146. (More references on this topic are given in the latter article.)

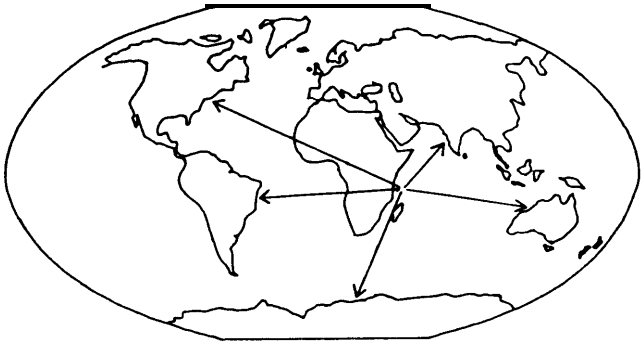

Figure 1. Arrows indicate the directions the continents moved.

through" less dense sediments covering the ocean floor (which have less gravitational influence) that tend to obscure many features (Bartusiak, 1984, pp. 80-85). Figure 2 is a sketch of the crater as shown on one of Haxby's maps. It is roughly 200 miles in diameter, with a cone rising near the center. The east-southeast-south rim of the crater is conspicuously raised, and from it three prominent splash arms extend. Beyond these arms, and concentric with the crater is an island arc, which is touched by the northern tip of Madagascar. *There is nothing remotely similar anywhere else on the ocean floor.* Anyone interested can see it for themselves in a photograph of such a map (Canby, 1983, pp. 282-283). Figure 3 is a reconstruction of the protocontinent before separation, with an X marking the point where the giant meteorite subsequently hit.

Meteorite Collision

What appears to have happened? A giant meteorite slammed into the protocontinent at a point considerably off-center. I propose that the giant meteorite, unlike smaller, non-penetrating meteorites that form craters by blowing material out and up (Shoemaker, 1960, p. 425), vaporized everything at ground zero and penetrated the crust, leaving behind a 200 mile-wide hole. The subsequent subterranean explosion can be compared to the impact of a high velocity projectile, which makes a small hole upon entry, but soon begins to compress the material in front of it. The region of compression moves away as a stress wave of spherical form. This results in cavitation, Figure 4, which can be temporary or permanent, depending on the material being penetrated. Cavitation takes place mainly after the passage of the projectile, and accounts for the explosive nature of high velocity penetrations (Farrar and Leeming, 1983, p. 163).

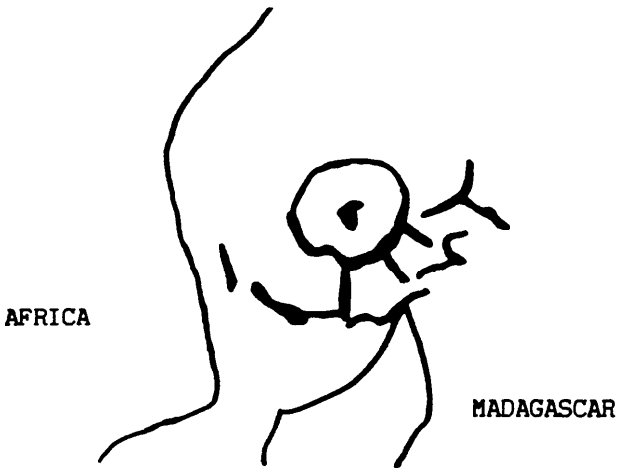

Figure 2. Sketch of the impact area made from Haxby's SEASAT map showing crater, raised rim, splash arms, and island arc.

This explosion deep in the crust unleashed a series of events which must be tracked individually. Relating the motion of the continents following the impact is like describing what happens to each fragment of glass when a rock crashes through a window. It is best done visually with a motion picture or series of snapshots. But the following brief verbal descriptions can convey the general idea.

The narrow strip of land east of the impact (Australia, India) blew away unimpeded. To the west, where the bulk of the protocontinent lay, it was a different story. Just as a line of adjacent billiard balls transmits a blow on the first ball in line through the central balls to the outermost ball, causing it to move away, Africa and Madagascar transmitted the force to the Americas and Antarctica, respectively. But as it did, East Africa buckled to form the East African rift system, with a double rift and considerable vulcanism directly opposite the impact site, in the vicinity of Lake Victoria. The Horn of Africa was forced westward about 250 miles, raising land (including Djibouti) and mountains in Ethiopia.

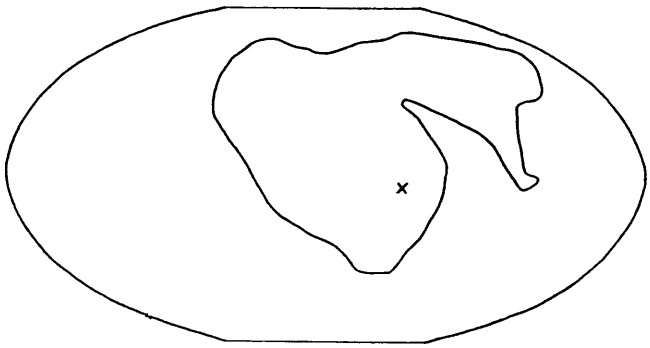

Figure 3. Author's reconstruction of the protocontinent. The "X" marks the impact point.

Australia was flung eastward from the impact site, It collided with a peninsula extending below Asia and splintered it into islands while raising low mountains in Australia's center. Rolling away, Australia finally ground to a halt, raising mountains on its eastern edge.

India was thrown out with great force, but rammed into Asia after having travelled only a short distance, The remaining momentum, and hence the mountain building, was obviously tremendous. As India punched inward, China was made to pivot clockwise on a point near northern Burma. Land was compressed into vast mountain chains. The collision forced the rest of Asia to move north, pivoting on Turkey (forcing Europe south, as on a seesaw and raising the Urals), leaving Japan behind, dragging the Kamchatka peninsula, and, in a "crack the whip" motion, spinning Alaska eastward until it collided with North America which was moving westward. Note that the secondary collision effects are small relative to the movement of the continents hit directly by the initial shock of the meteorite impact.

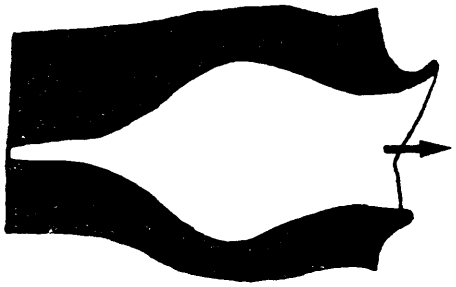

Figure 4. Cavity produced by a high-velocity steel sphere in a soap block. Tracing from a photograph (Farrar and Leeming, 1983, p. 185).

North America moved smoothly westward, the push raising the Appalachian Mountains, then began shedding pieces from its northern and southern regions, then ground to a halt, forming vast mountain chains along its leading edge and fractures in the crust ahead of it. Simultaneously it collided with Alaska which was spinning off of Asia. Europe was drawn out as North America separated, then forced down again toward Africa by the turning of EurAsia.

South America moved away from Africa in unison with North America and Antarctica, the push raising low mountains in the eastern region. Antarctica rotated slightly counterclockwise as it moved, South America clockwise. Again the continents ground to a halt, forming mountains on their leading edges.

Crustal Deformation

That the crustal deformation was the result of an impulse event rather than steady motion over a long period of time is suggested by a combination of observations:

1) The continental journeys had a beginning, middle, and end. Great distances were crossed quite smoothly. Moving land masses appear to have experience dramatically increased friction as they neared the end of their runs. As the braking began along the edges, "skid marks" in the form of gouged trenches and island trails were laid. These include the Kuril Islands and Trench, the Aleutian Islands and Trench, the Sunda Island and Java Trench, the Diamantina Fracture Zone, islands of the West Indies and the Puerto Rico and Cayman Trenches, and the Scotia Ridge and South Sandwich Trench.

2) As they moved, some land masses unfolded (southern South America, Antarctica, Central America), collided and changed direction (Australia), and rotated, at least slightly (Alaska, North and South America, Antarctica, India, Australia), displaying the effects of tugging by neighboring attached land masses, glancing collision, and an imbalance of force applied to one side of a land mass' center of gravity, respectively.

3) Land masses were crushed only partially. If our car had hit the bridge abutment at, say, 1000 mph rather than at typical road speed, or was slowly and steadily being forced against it over a long period of time, the entire car would be crushed like an accordion, not just the front end. In every case, the land masses sustained limited damage regardless of the distance traveled. This suggests that force was applied in a limited amount over a limited period of time; that is, an impulse force.

Time of Impact

When did all this occur?

> It is clear that the vast, marine Paleozoic series was deposited by the Noahic Flood *before* the uplift of these great mountains [of North and South America and the Alps]. Broken remnants of those marine deposits are lifted and tilted, shattered and even left as pendant formations high in these mountains. The mountain uplift which produced all of the world's great mountains is a post-Noahic Flood phenomenon (Northrup, 1988, p. 105).

This would mean that, in addition to having a much lower landscape to cover with the Flood waters, when the Ark landed, Ararat was not yet in the middle of mountains that stretch for hundreds of miles in all directions. Surely these mountains would have posed a serious obstacle to many of the creatures exiting the Ark. It is tempting to further narrow the estimate of when the impact occurred by placing it in the days of Peleg, based on Genesis 10:25, hundreds of years after the Noahic Flood.

Today we are left with the hardened remains of a very fluid event. Zones where rapid upwelling and subduction occurred are now weak points in the crust and foci for earthquakes as the geoid is jostled by the gravitational pull of its neighbors and other forces. A stream runs in the bottom of the Grand Canyon, but that does not mean the stream cut the canyon. Our crashed car creaks and shakes as it is buffeted by the wind, but the crash itself has long since occurred. Very slight shifting of plates has been detected, and there are earthquakes and volcanic eruptions, but that is not the process of continental separation.

Summary and Necessary Questions

This article is intended only to introduce a new theory. At the same time that it demonstrates what may have happened, it raises many questions that must be dealt with in future discussions. Among these are what was the nature of the underlying strata that allowed the continents to move, and how did it change? What would have been the effects on Earth's rate of rotation, wobble, magnetic field, and climate? At what speeds did the land masses actually move? Just how big was the meteorite? Did the famous iridium deposition at the Cretaceous-Tertiary boundary come from this impact? If it did, it presents the interesting possibility that the layers above that boundary, and a mass extinction (on a lesser scale than the Noahic Flood), may have been the result of cataclysmic wave action and flooding caused by the rapidly moving land masses.

Combining mass and speed, meteorites are the artillery of outer space. They have scarred and perhaps tilted or shattered moons and planets in our solar system. It is not unreasonable to consider that a giant meteorite reshaped the surface of the Earth into what we see today.

Acknowledgment

The author is sincerely grateful to Dr. George F. Howe for his interest in and support of this work through his provision of source material, helpful remarks, and editorial assistance, and for reopening his Mini-Symposium on Orogeny.

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BOOK REVIEWS

Origins: What Is At Stake? by Wilbert H. Rusch, Sr. 1991. Creation Research Society Books. Kansas City, MO. 73 pages. $8.95.

Reviewed by George F. Howe*

In the introduction of *Origins: What Is At Stake? (OWIAS)* Joanne Rusch (the author's daughter, who is a systems architect and a mother) asserts that macroevolutionist is just a theory and that creationism deserves a place in education and in the home. In his own preface the author, one of the founders of CRS, tells that in *OWIAS* he deals with theology as well as science so that the book will have greater value to Christians who study origins.

In one major section, pp. 6-19, Rusch selects 10 terms and phrases commonly encountered in origins discussions. For each of these he provides clear definition and quotations which support and amplify the definitions.

In a chapter which bears part of the book's title *(What Is At Stake?,* pp. 20-28) the author explores six aspects of Biblical theology and affirms that each one is undercut if an individual rejects or mutates Biblical creationism: 1) the doctrine of God; 2) the doctrine of the Holy Scriptures; 3) the concept of miracles; 4) the nature of man; 5) the doctrine of original sin, and 6) the historicity of the Genesis Flood. Rusch declares that all of these are placed in question "If a modern liberal approach to the Scriptures . . . is taken . . ." (p. 20). He proposes that if creationism is replaced by theistic macroevolutionist, the entire basis of Christian faith is at stake.

Pages 20-32 of *OWIAS* contain a lucid discussion of three geological "oddities" that Rusch, a geologist, views as serious problems confronting macroevolutionists and all other uniformitarians: cyclothems, polystrate tree trunk fossils, and amber deposits containing fossil insect remains as well as plant parts. This section includes some quotations from the man who studied these massive amber deposits in exquisite detail: Heribert Nilsson.

In a unit entitled "Philip H. Gosse and Navels" (pp. 42-45) the author reasons that many diverse natural phenomena would have manifested "apparent age" immediately after creation. Here Rusch explains why he believes it is folly for any individual who accepts redemption by Christ to turn around and reject creation.

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By way of "Some Concluding Thoughts" (pp. 52-54), the author notes that

> . . . the question of origins is really a philosophical question outside the domain of science . . . and that . . . the high school level student receives a biased, utterly one-sided view of this whole question . . . (p. 54).

He reiterates the hope that Christians will not accommodate the doctrines of the Church to macroevolution.

As in his previous book *The Argument,* available from CRS Books, at the end of *OWIAS* Rusch treats his readers to an updated array of appendices covering the taxonomic hierarchy, the geological column, creation references in Scripture, an annotated reading list, and a battery of colorful quotations. There is also a descriptive history of the Creation Research Society and the author's view of debates. The last two pages are an index.

As a teaching tool, *OWIAS* will certainly be a useful companion volume to *The Argument.* It should be read by all Christians who have abandoned creationism or are thinking of doing so, perhaps many of these will reject macroevolutionism after scrutinizing Rusch's reasonings and warnings. *OWIAS* should also be studied by faithful creationists so they will realize how fully their origins view rests not on science alone but also on the "holy ground" of an absolutely inerrant Bible, as proposed by Bill Rusch. The breadth of topics covered, the winsome writing style, the balanced mix of science and Scripture, and the modest price make *Origins: What Is At Stake?* an ideal book to own and to use as a gift.

"Vestigial Organs" Are Fully Functional (A History and Evaluation of the Vestigial Organ Origins Concept) by Jerry Bergman and George Howe. 1990. Creation Research Society Monograph Series: No. 4. Creation Research Society Books. Kansas City, MO. 95 pages. Paperback, $10.95.

Reviewed by John R. Meyer*

The expedition of Lewis and Clark in 1804-1806 would seem to have little to do with the creation/evolution controversy and the problem of vestigial organs. Yet, an incident during that epic exploration serves to illustrate one of the problems in attempting

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to support evolutionary theory with the vestigial organ argument. On about August 19, 1804 Sergeant Charles Floyd, a member of the expedition, was buried on a grassy knoll near where the Sioux River enters the Missouri. Of the more than 40 adventurers on the two-year expedition into unknown rugged Indian country, Floyd was the only casualty. The cause of death was not Indian or grizzly bear attack, starvation or drowning. It was appendicitis.

Before the advent of modern surgical techniques and antibiotics, appendicitis was a life threatening affair and a ruptured appendix meant almost certain death due to peritonitis. A very significant number of people previously died in this manner. If the appendix is, in fact, a vestigial organ, a useless derelict from a previous evolutionary ancestry, the selective pressure against such a troublesome atavistic organ should be enormous as the case of Sergeant Floyd illustrates. Such supposedly defective and dangerous structures should have been eliminated long ago from the human genome. That is, unless the human species is of very recent origin, or the appendix is a useful organ, or both.

For nearly 150 years the argument for evolution based on vestigial organs has been used as a cudgel in an attempt to verbally beat special creationists into conformity with one form or another of evolutionary philosophy. It is still a popular argument in evolutionary polemics often found in high school and college texts and advanced treatises on evolution. The time has come for a detailed and scholarly refutation of the vestigial organ argument. The book, *"Vestigial Organs" Are Fully Functional* meets this need admirably. The authors are experienced writers and have assembled by far the best refutation to date of the vestigial organ scenario.

The authors first address the subject by a discussion which demonstrates the importance which evolutionists attach to this subject and the decisive blow which they feel it deals to special creation. For example they note that "historically, vestigial organs were considered one of the most important evidences demanding mega-evolution" (p. 1). The authors note the important role which this philosophy played in Darwin's thought and point out that in 1895 Wiedersheim claimed 185 rudimentary structures in man alone. A number of examples of contemporary appeals to the vestigial organ scenario are provided to demonstrate the current extensive reliance of evolutionists on this line of supposed evidence.

The authors review a number of evolutionary explanations for the supposed existence of vestigial organs. These include the argument of dysteleology (bad design), loss mutations, negative allometry, panmixia, reversal of selection, and the "law" of material compensation. These are all shown to be impotent explanations. Apparently the real reason so much was made of vestigial organs was that they were thought to be an embarrassment to creationists and thus the arguments were highly prized.

In reality, a creationist would have no problem fitting vestigial organs into the creationist model *if they could be found.* Bergman and Howe note that:

> There is nothing in the design model, however, which would conflict with the presence of some vestigial organs. The existence of a vestigial organ would support the belief that some highly functional structure had undergone changes by which it became less functional or even useless. These data would be accommodated easily in the design model as evidence that degenerative changes have occurred since the time of creation. The presence of vestigial organs would support only de-evolution: they would not refute design (p. 8).

In this reviewer's experience of more than 30 years of studying, teaching, and research on mammalian systems I have never once encountered a single cell, tissue, organ or organ system that in any way could reasonably be defined as vestigial. In physiology one looks for and expects, function. The carotid body, which I studied for eight years, was until nearly 1940 thought to be a vestigial organ. For nearly a half century, research on this organ was delayed because of evolutionary presuppositions. It is now known to function as the only peripheral sensor of circulatory oxygen tension. Located at the bifurcation of the internal and external carotid artery and exhibiting the highest blood flow per gram of tissue of any organ in the body, it is ideally situated and designed to fulfill its function. It is rarely needed in a normal healthy human but provides significant drive to the respiratory control center of the brain for persons whose peripheral blood oxygen is at dangerously low level, as for example in chronic obstructive lung disease. This "vestigial organ," rather than being an atavistic throwback to some subhuman ancestor where it previously enhanced survival of the fittest has now been demonstrated to be an integral part of the respiratory control system which is called upon by the sick and elderly to help insure survival of the "least fit. "

The second part of the book deals with functions of specific organs still believed to be useless vestiges. This list included the coccyx, human hair, tonsils and adenoids, appendix, pineal gland, nictitating membrane of the eye, Darwin's point on the ear, male nipples, spurs on snakes, hip bones of whales, horse splint bones, and blind cave fish. Of particular interest is the authors' discussion of the supposed tail on human embryos and the birth of an infant with a supposed tail. The latter was reported in the prestigious *New England Journal of Medicine* (Ledley, F. D. 1982) and produced great interest. Bergman and Howe report, however, that the appendage was 1.5 cm to the right of the midline and contained no boney structures. The highly touted "human tail" was in reality nothing more than a dermal (skin) appendage resulting from an abnormal developmental process. Such dermal flaps are rare but may appear on many different parts of the body. This one happened to be positioned such that it only very superficially resembled a tail. There was thus not the slightest evidence that it was genetically induced and to give it attributes of a vestigial organ was clearly inexcusable.

The book closes with the following conclusion:

> Since virtually all of the so-called vestigial organs are shown to have functions, macroevolutionists can no longer credibly claim that evolution is the only origins model that will accommodate these scientific data. Individuals who are not fully indoctrinated with evolutionary philosophy will be

able to see that all body organs function harmoniously. Dispelling the concept of vestigial organs allows the Creator's work in biology to be viewed scientifically as neither evolutionary, defective, nor capricious, but as evidence for His handiwork and design (p. 85).

This book is highly recommended. It should be considered as essential reading for anyone who has a serious interest in the biological aspects of origins. It is well written and will make an ideal book to give to a committed evolutionist regardless of academic level. The 12-page bibliography makes the work highly significant as a starting place for more detailed studies into the history and philosophy of the last 150 years of biological science. This work deserves the widest possible circulation.

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Darwin on Trial by Phillip E. Johnson. 1991. Regnery Gateway. Washington, D.C. 195 pages. $19.95.

Reviewed by Wayne Frair*

Berkeley law professor P. E. Johnson demonstrates how Darwinists generally define evolution as a "fact"-Johnson prefers the term "hypothesis''-but do not subject their concept to critical evaluation. Johnson identifies himself in chapter one as a theist and Christian, but he is negatively wary of creation-science and Biblical fundamentalism. Effectively Johnson is most strongly opposed to the divorce of "science" and "theism" as commonly reflected in naturalistic evolutionary teaching. "Make no mistake about it," he says, "in the Darwinist view, which is the official view of mainstream science, God has nothing to do with evolution" (p. 114).

Evolutionists are viewed as vigilantes demanding unconditional surrender to a mechanistic understanding of the universe. As evidence that evolutionists have their own atheistic metaphysical system he cites recent events in California and the strong negative reaction of the evolutionary establishment to an American Scientific Affiliation booklet mainly because it raises questions about naturalistic (chance) understandings of origins.

Johnson has a comprehensive grasp of the main issues involving science and religion, and he effectively covers the main evolutionary considerations—natural selection, mutations, fossils, molecules, and abiogenesis along with some legal matters. Observational data from nature generally are to be understood as not supportive of large scale evolution (macroevolution). For example, he says, ". . . the outstanding characteristic of the fossil record is the absence of evidence for evolution" (p. 50).

There are some footnotes at the bottom of pages and following about 150 pages of text are 34 pages of "Research Notes" containing further comments and references (books usually without publishers). Then there follows a seven-page index of subjects and personages. Literature referred to in the book generally is by authorities respected within the evolution community, thus adding to the potential impact of the publication upon scientists.

I have not found major deficiencies in the work, but there are some minor matters deserving mention. For example in chapter seven dealing with "The Molecular Evidences" it says that this evidence never has been evaluated without Darwinist bias. This is only partially true because the late Dr. Alan Boyden who was my Ph.D. advisor and a leader in this field from the 1930's into the 1960's took a dim view of extrapolating from microevolution to macroevolution (Boyden, 1973). My own research in this field always has been done using a creationist perspective (Frair, 1991).

In the fossil chapter Johnson repeats the common misconception that the famous nineteenth century French scientist, Cuvier, believed there were "periods of creation" following catastrophes as observed in the geological record. Indeed Cuvier held to fixity (immutability) of species, but he thought that recolonization after catastrophes occurred as a result of organisms coming from other regions. Even though Cuvier did not promote the view that there were *creations* after the catastrophes, some of his students did.

On the whole Johnson's is a powerful work. Johnson has been influenced by Michael Denton's book *Evolution: A Theory in Crisis* (Denton, 1986). I feel very strongly that both Denton's book and now Johnson's *Darwin on Trial* should be required reading for all serious students of origins.

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Frair, Wayne. 1991. Original kinds and turtle phylogeny. *CRSQ* 28(1):21-24.

The Big Bang Never Happened by Eric J. Lerner. 1991. Random House. New York. 466 pages. $21.95.

Reviewed by Danny R. Faulkner*

This popular-level book has a very catchy title, one that is sure to pique the interest of anyone familiar with the Big Bang cosmology. This is especially true of special creationists, who largely dismiss the Big Bang, primarily because of the vast age that the model requires for the universe, as well as the lack of involvement of a personal deity. Such a title holds much promise, but this book will fail to satisfy most readers. True, the first chapter is devoted to inadequacies of the Big Bang model especially when compared with observations, but all of this is already documented and is well known to those presently opposing the model.

Over half the book is about sociology: the author traces the history of civilization and attempts to establish a correlation between economic practices (slavery versus free labor, free trade, etc.) and the scientific philosophy and the prevalent cosmology of various societies. There is much here for just about everyone to disagree with, and at points the analysis is a bit sloppy. For instance, at one point Lerner states that

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the standard of living of the world and even in the industrial countries has declined across the board since 1973. Besides his implication that this is because of the preeminence of the Big Bang cosmology today, one has to question the methods and definitions used to arrive at the conclusion about the declining living standards. Many would disagree that the standard of living of this country has declined over the past decade. His main theme is that periods of time dominated by limited, finite cosmologies have led to economic, technological, and philosophical stagnation, while times in which infinite cosmologies are popular have been marked by progress.

Most of the rest of the book expounds an alternate cosmology, one that was first proposed by the famous plasma physicist Hannes Alfven. Astronomers generally assume that the dominant force in the universe is gravity, while relegating electric and magnetic forces to very minor roles. Lerner notes that plasma effects are demonstrably important in the laboratory and in the solar system, but that plasma physics is largely ignored by extragalactic astronomers and cosmologists. He goes so far as to compare this to the medieval idea that the physical laws on earth are fundamentally different from those in the cosmos. This is a legitimate point, and the author offers a plasma physics explanation for spiral galaxy structure and the power source for active galactic nuclei and quasars, which does not require massive black holes. It is assumed that space is filled with a plasma and that the universe is laced with electric and magnetic fields that are sufficient to give rise to very widespread and, at first, feeble current densities. Ultimately the pinch effect in the plasma will greatly increase these current densities to produce some of the vortex structure seen in the universe and supply the tremendous power often required of objects such as quasars. The author complains that these ideas have been ignored by the astronomy establishment to date, and hopes that his book will at least cause some discussion of these unconventional ideas.

Creationists might at first be attracted to the plasma cosmology, but will be quickly repelled by the universe proposed. For instance, this cosmology is infinite in both space and time: it is explained that the present observed expansion of the universe is not caused by a past singularity, but by a large local fluctuation that was powered by a compression, followed by an expansion resulting perhaps from matter-antimatter annihilation. This of course avoids the problem with the first law of thermodynamics that a singularity presents, but an infinite universe suffers from a violation of the second law of thermodynamics. It is argued, quite unconvincingly, that the second law is of only limited validity. This is not a new idea in that some ancient infinite cosmologies assumed that from time to time order arose out of chaos, just as evolutionists do today. The author assumes that on many scales the entropy chips are somehow "cashed in," giving rise to order, but this appears to commit the sin of the medieval cosmology criticized by Lerner: the assumption that terrestrial and celestial laws are fundamentally different. This is a matter of faith and is evidenced by the author's frequently stated belief that cosmic evolution, biological evolution, as well as the evolution and improvement of man and society are inevitable facts of the universe.

Dictionary of Science and Creationism by Ronald L. Ecker. 1990. Prometheus Books. Buffalo, NY. Cloth. $32.95.

Reviewed by Jerry Bergman*

Ecker has produced a readable, well organized, basic introduction to the evolution versus the creation world views. Intended primarily for nonscientists, it is one of the few science books that motivated me to complete in a single sitting (and I even learned a few things to boot). Since many non-fiction books are used primarily for reference, the "dictionary" format is very useful, and not surprising considering that the author is a librarian. This format uses a topic sequence, while most other books are presented chronologically or in some other logical way. If other authors followed this format, books would be far more assessable. Indexes are designed to help a person find information of interest, but their use is often very time consuming. About the only disadvantage of this "dictionary" format is that a concept is often defined in several sections so that each topic covered is understandable as a unit.

A major concern is "why would a librarian, evidently with no training in science, write a book on creationism?" This work is actually not a dictionary of *science and creationism*, but rather is a dictionary of *anti-creationism*. The author argues vigorously against both the creation world view and most of the common arguments that creationists use to support their position. Indeed, he often argues polemically in a way that is reminiscent, not of science, but theology. Since most scientists and science students need no convincing—they already believe the molecules-to-man evolution world view—this book will serve primarily to reinforce a belief which is common to all of the sciences. This work illustrates extremely well just how weak the case is for evolutionism; all of his major arguments have been effectively refuted by recent research.

While reviewing this book, it soon became apparent that it conformed to a hypothesis of mine about those who write books against creationism: many have personal vendettas against Christianity. Some have had negative experiences with some church that not only caused them to leave, but also motivated them to actively oppose religion in general, especially the creationist world view. Ecker includes a large number of discussion of biblical topics, and also hints that he was raised in a conservative church which espoused special creationism. Interestingly, Ecker dedicates his book to his parents, Roy and Lucille Ecker, whom he labels "two special creationists" (dedication page). This, of course, does not argue against the validity of his conclusions, but it does help to understand the writer's motivations and background, which in turn helps us to assess his work. Ecker throughout the book criticizes not just religion, but conservative Christianity, noting that his criticisms are specifically against the "*fundamentalists,*" a term he never defines. He says virtually nothing negative about other religious groups, even claiming that "I want to stress that this book is not 'against' the concept of the creator,' but the concept of the creator that the "fundamentalists" paint."

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Ecker relies heavily upon books and articles written by the leading anti-creationists, often quoting uncritically from them. And as is often true of polemical works, he grossly overstates his case. For example, his discussion of Archaeopteryx implies the conclusion that Archaeopteryx as a clear transitional form between birds and reptiles enjoys scientific unanimity. The fact is, much debate still exists in the scientific community on the whole status of Archaeopteryx. A review of its status in *Nature* by Michael Benton of the Dept. of Zoology, and University Museum, Oxford, concludes that there is "no consensus on Archaeopteryx" (Benton, 1983, p. 99). Some of the questions that scientists are still debating include, "can the bird fly, is it ancestral to birds, did it originate from dinosaurs or from some earlier stock and, indeed, is it even a bird?" Benton quotes a recent study on the brain case of Archaeopteryx that concludes that the "details of the braincase and associated bones at the back of the skull seem to suggest that Archaeopteryx is not the ancestral bird . . ." (Benton, 1983, p. 99). He concludes that the relationship of Archaeopteryx and the origin of the birds is very controversial, and notes in a recent review that Thulborn and Hamley identified seven hypotheses concerning the affinities of *Archaeopteryx* (Benton, 1983, p. 99).

Likewise, in section after section, Ecker incorrectly implies that the facts are in, the case is closed, and there is no need to look any more, when in fact this is decidedly not the case. In science, in contrast to the courts, a case is *never* closed. Those of us who teach basic science methodology must repeatedly stress that the *only* viable methodology is science agnosticism, not evolutionism. This does not mean that we cannot relate the best evidence and present current conclusions as highly reliable (indeed, many are) but that we should repeatedly stress that true believerism has been a major historical impediment to scientific progress. The law of gravity may be one of the most firmly established laws in science, but we nonetheless should not be discouraged from examining empirically the law further so as to try to learn more about its ramifications or even the specific situations in which the law may not hold.

Even something as basic as the hypothesis that the earth is spherical can and should be questioned. Quite often further research does not overturn a theory, but modifies it. The initial questioning, though, is imperative for this to take place. Someone had to first ask the question: "Are we *sure* that the earth is spherical?" When more accurate re-measurements were completed, we found that it is not a perfect spheroid, but the equator diameter is 54 miles greater than the pole to pole to pole diameter, and our globe also has many other comparatively small, but significant deviations from a spheroid. If there is anything that we have learned from the history of science, it is that the tentative position about every science view is the *only* one that works in the long run.

Ecker (p. 170) himself states that "in science we are thus dealing with 'different levels of probability' . . . . never with certainty. Nothing is ever proved to be true, things are 'at best highly probable'." Yet, Ecker ignores his own advice and constantly openly states, or at least implies, that most all of the arguments that he relates to prove evolution, many of which are actually highly controversial in science, are fact. Even though many conclusions are highly probable, *all* science conclusions should be stated as conditional. It is true that scientists have beliefs about world views, race, and gravity, but science must recognize these as beliefs and work under the primacy of the agnostic position.

Ecker does admit on a few topics such as abiogenesis that much controversy now exists. This section sounds more like it was written by a creationist; he even concludes that "creationists are absolutely right" (p. 14) and "moreover, creationists are right when they say that" (p. 15). He also admits disagreement by scientists on the topics of extraterrestrial life (p. 124), mammal evolution (p. 128), the origin of the solar system (p. 183), the interpretation of Australopithecines (pp. 33-34), and geomagnetic theories (p. 104). Although Ecker is certain that molecules-to-man atheistic evolution occurred, he is not so certain about many aspects of modern cosmology. He calls the big bang theory "hypothetical" (p. 31) and even concludes that the universe is "apparently" expanding (p. 31).

To discuss in the required depth the scientific controversy surrounding the conclusions that the author covers would take far more pages than the 263 in this book. If one must decide between brevity to the point that a distorted picture results and not saying anything at all, the latter may be preferable. Writing a dictionary on such an enormous topic requires at least several thousand pages. The *introductory* texts that I use in my biochemistry and biology courses are usually over 1,000 pages.

The primary group that he attacks is the Institute for Creation Research, especially Duane Gish and Henry Morris. Ecker dichotomizes the controversy enormously, ignoring all of the numerous other creation groups. He also incorrectly assumes that most of those involved in the creation movement are fundamentalists, specifically involved in denominations such as Baptist (p. 58). He even claims that most mainline Protestants are not creationists, indicating very superficial research in this area (p. 37). As Nelkin (1977) points out, the creation movement is widely diverse, and many of the founders and the leaders of some of the larger creation groups, such as the Creation Research Society, are Lutherans, Presbyterians, Seventh Day Adventists and other mainline denominations. Lutherans have figured prominently in both the Creation Research Society and other groups, and none of these groups are "Baptist fundamentalists" (p. 115).

Ecker seems oblivious to the fact that many Jews, Moslems, and Roman Catholics are also creationists. Well-known Catholic creationists include Dr. Roberto Fondi, professor of paleontology at the University of Siena, microbiologist and geneticist Dr. Guisepe Sermonti, geneticist Macie J. Giertych, quantum chemist Dr. Edward Boudreaux, and Guy Berthault. He also ignores the Jewish Creationists such as Robert R. Perlman, Morris Goldman, Carl N. Kahr and others.

Rather than a single united creationist front existing, far more accurate is Nelkin's 1982 (p. 79) statement

that "religious groups concerned with doctrinal purity are characterized by schisms. Creationists are no exception . . ." Ecker does admit that some prominent scientists are "creationists" although these statements cause even more confusion because of his use of the word creationists. He notes, for example, that Theodosius Dobzhansky, "describes himself as a creationist and an evolutionist." And he consistently refers to Dobzhansky as a "Christian geneticist," (pp. 26, 206, 208) or "a Christian," (p. 43) and "a Christian believer," (p. 82).

In many cases the author is simply wrong. For example, he incorrectly states that the story of Adam and Eve is considered "literally true only by fundamentalists who insist on a doctrine of biblical inerrancy" (p. 19). Actually, where he shines is in his discussion about theology, not science. Many who purchase his book assume that it is about *only* the scientific problems with the creationist world-view, and since the book is intended for public schools, it may have been far better to focus *totally* upon science. His many long scriptural discussions and interpretations may spark theological disputes, but this is a topic that those in state supported higher education find uncomfortable dealing with in science classes. One thus might experience legal problems using this book in public schools because of its heavy theological content.

Although the author states in the preface that "this book is not 'against' the concept of a creator," in the 209 pages of text, he argues almost exclusively for atheistic evolution. As many scientists have stressed today, the scientific community needs to be more open about its presuppositions and conclusions and, especially, where modern science evidence has led us. Ecker makes a strong case for atheism, arguing that all past attempts "to prove God's existence by logical reason" have now been "found wanting." Accordingly, he also argues against theistic evolution, quoting Dawkins who calls evolution a "blind, unconscious, automatic process" with "no purpose in mind" (p. 140). Ecker concludes that "the idea that evolution is somehow *teleological* or purposeful, or that it involves some inner drive towards perfection (a concept called *orthogenesis),* was popular in the late nineteenth century, but is not taken seriously by any competent biologist of the late twentieth" (p. 88). Ecker reminds us that the scientific community is in a high level of agreement on this conclusion. He notes that even scientists such as Robert Jastrow "who calls himself an agnostic" because he interprets Planck's time (the first instant of the big bang) in a possible religious sense are "accused of duplicitously pandering to theists" (pp. 202-203).

It is ironic that books such as this which argue strongly for atheism are widely used in public schools, but the other side is typically censored from most science classes and libraries.

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Inner Earth: A Search for Anomalies by William R. Corliss. 1991. The Sourcebook Project. Glen Arm, MD. 224 pages. $18.95.

Reviewed by Don B. DeYoung*

William R. Corliss has cataloged unexplained phenomena in nature for 20 years. During the 1970's he produced 10 looseleaf "sourcebooks" of unusual science findings in astronomy, archaeology, etc. Next came a series of six handbooks with thorough literature documentation. Presently, Corliss is publishing hardcover catalogs on various topics which will eventually number 25 volumes. He plans to provide a systematic data base for 30,000 articles of special interest. Corliss calls his entire, ambitious literature search *The Sourcebook Project*. A bimonthly newsletter of current anomaly reports, *Science Frontiers,* now numbering 77 issues, is also sent to subscribers.

This eleventh catalog on the *Inner Earth* continues the Corliss tradition of presenting unusual science data in a concise and fascinating manner, complete with original drawings. Article excerpts discuss seismic signals, magnetic variations, and heat flow. Subjects include deep-focus earthquakes, exotic terrains, midplate volcanism, and compass anomalies. Corliss concludes that "Hundreds of kilometers below the surface lurk huge pieces of foundered continental crust and bizarre structures of unknown origin" (advertising flyer). Several *CRS Quarterly* articles are summarized by permission, especially John Woodmorappe's geologic column work and Thomas Barnes' magnetic field studies. The Corliss books are popular in university libraries, so they will surely be useful in publicizing our creationist material. Any of the materials by William Corliss are recommended, including *Inner Earth.* In a parallel way to creation science, Corliss has the mission of airing unconventional science ideas.

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The Practical Paleontologist by Steve Parker. (Raymond L. Bernor, Editor.) Simon and Schuster. New York. 160 pages. $14.95.

Reviewed by Clifford L. Lillo*

The book cover describes this work as "a step-by-step guide to finding, studying, and interpreting fossils—from searching for sites to extracting, cleaning, and restoring finds." Not written from the creationist perspective, it nevertheless provides helpful information for discovering fossils and gaining useful data from them.

In the first paragraph of the Introduction the author makes clear his view on origins, saying, "Without the efforts of enthusiastic amateurs . . . we would know less about . . . the origin of life itself—and where our own species came from" (p. 8). On the same page he states, "Life, spawned and nurtured by these irreversible events, has itself become a shaping force over the past 3.9 billion years (p. 8).

The creationist who is eager to get started need not be dissuaded by such bias and can use the author's information to gather fossils and refute the author's own claims.

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He begins with a history of paleontology, going back to Xenophanes, Pythagoras, and Herodotus, stating that these ancient philosophers believed that, since fossils of sea creatures were found inland, the sea had once covered the land. Then, instead of stating that the Bible supports this viewpoint because of the Flood of Noah, Parker claims,

> So from the fourth century, the Church taught that fossils had been placed in the ground by the Devil, to tempt people into questioning the truth of the Bible (p. 14).

Notable in this book is the avoidance of anything which might cause the reader to think that fossils were the result of a universal Flood. The author says,

> So it follows that fossils are most likely to be preserved where the conditions for decomposition are poorest; where moisture, oxygen or warmth are excluded, or where there are lethal toxins or extreme heat or pressure. The bottom of the sea is a good bet, as animals and plant remains sink into a stagnant ooze. (p. 32).

In a picture on the same page, four stages of fossilization are shown, the first stage being, "The animal dies and falls to the sea or lake bed" (p. 32). A less biased author might have said, "The animal, whether living or dead, is suddenly covered over by a layer of mud."

In case a reader skims over such statements, Parker devotes 37 pages or nearly a quarter of the book to a section called "The Evolution of Life."

Disregarding the bias of the author, the reader will find valuable advice on how to recognize a fossil, where to look, the proper clothes to wear, getting permission to search, what tools and equipment are required, how to do grid mapping, and how to extract the fossil. Both creationists and evolutionists can profit from this book.

Science Matters: Achieving Scientific Literacy by Robert M. Hazen and James Trefil. 1990. Doubleday. New York. 294 pages. Hardcover. $19.95.

Reviewed by A. Jang*

Robert Hazen and James Trefil are, respectively, Professor of Earth Science and Professor of Physics at George Mason University. They wrote this book to promote scientific literacy and greater citizenship in dealing with the scientific issues that affect people's lives. They feel that everyone needs background knowledge to understand how scientific and technological developments occur and what their consequences are likely to be in order to "take part in the national debate about them" (p. xii).

The authors report that fewer than 7% of American adults and only 22% of college graduates can be classed as scientifically literate. Even working scientists are often illiterate outside their own field of professional expertise. For example, only three out of a group of 24 physicists and geologists were able to explain the difference between DNA and RNA (p. xiii).

> The fact of the matter is that the education of professional scientists is just as narrowly focused as the education of any other group of professionals, and scientists are just as likely to be ignorant of scientific matters as anyone else. You should keep this in mind the next time a Nobel laureate speaks *ex cathedra* on issues outside his or her own field of specialization (p. xiii).

Perhaps this quote should also be kept in mind the next time a group of Nobel laureates signs an Amicus Curiae Brief supporting the "fact" of evolution!

The authors state that the solution to scientific literacy must begin with the simple recognition that "IF YOU EXPECT SOMEONE TO KNOW SOMETHING, YOU HAVE TO TELL HIM OR HER WHAT IT IS" [their capitalizations] (p. xvi). And who does the telling? "So scientists must define what parts of our craft are essential for the scientifically literate citizen" (p. xvii). This posture, which seems contrary to what is encouraged in good science education (the teaching of critical thinking and learning by inquiry), is maintained throughout the book which in effect becomes an "answer" book.

The book is organized around 18 central concepts which are introduced in the first five chapters and later expanded. These "laws" are claimed to be "absolutely essential" to explain everything in the world. "understanding this core of knowledge, then, is what science is all about" (p. xviii).

The authors' predilection for the physical sciences may explain the uneven attention given to certain topics. The first chapter deals with the question of how scientists know what they know. The next 13 chapters discuss basic concepts in the physical sciences (e.g., Electricity and Magnetism, The World of the Quantum, Chemical Bonding, Atomic Architecture, Particle Physics, Relativity, etc.). Only the last four chapters deal with the life sciences, and even these are largely discussed from a physico-chemical perspective. The lack of a section on health and medical issues is surprising since this is probably an area of greater concern to the average layman than most of the subjects covered in the book.

And, alas, there is the chapter on evolution! It begins with the pigeon-holing of creationists (i.e., "this is what Creationists believe . . ."). The comment is made that "Creationists subordinate observational evidence to doctrine based on their interpretation of sacred texts" (p. 243). This stereotype fails to account for the many creationists who were skeptical of evolutionism prior to having any religious moorings. The authors also fail to point out that the problem lies *not* in the observational evidence, but in the metaphysical baggage that *both* creationists and evolutionists sometimes bring to bear on interpreting the observational evidence.

Evolution is claimed to be as much a fact of science as the fact of gravity (p. 245). This is, of course, a gross exaggeration since faith in any theory to account for a singularity or any other claims in the area of origin science can never be asserted with the degree of certainty that is possible in the area of operational/empirical science. The former can never be directly proved whereas the latter is directly testable.

In a brief discussion of the origin of life from nonlife, the book assumes that the original atmosphere was a reducing atmosphere (pp. 245-246), an unproven assumption that flies in the face of geochemical evidences to the contrary (Thaxton, Bradley, and Olsen,

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1984). The unsupported statement is made that the fossil record offers "the most dramatic evidence for evolution." The authors assert that fossils "prove" that macroevolution has been occurring for almost four billion years (p. 252). If the purpose of this book is to help John Q. Public become scientifically literate, then there is nothing to commend it here since no fossil evidence is given. The reader is offered nothing but the authors' unsupported conclusions. There is not even mention of any of the alleged transitional forms such as *Archaeopteryx*. Compared to the coverage given to the physical sciences in the earlier chapters, the superficial treatments in some of these latter sections were disappointing.

Punctuated equilibrium and gradualism are placed on equal footing, with the claim that the fossil record is not good enough to adjudicate between them (p. 255). It is pointed out, however, that although "the fossils . . . are at best a spotty historical record of earth's life" (p. 252), earth had undergone numerous catastrophes (pp. 256-257) and the fossil record argues against Darwin's view that species had gradually evolved at a relatively constant rate (p. 256).

Reading this book was like reading an almanac. While it was interesting in some places, it was quite dry elsewhere. "Frontiers," an interesting section found at the end of each chapter, places each set of information in the context of contemporary research and exciting future applications.

The book has 26 illustrations (mostly line drawings), a list of additional readings, and an index. Surprisingly, for a book designed to present an overview of science for the layman, there is no glossary. Despite its weaknesses (uneven subject treatment, authoritarian tone, and the lack of footnoting and documentation), this book is recommended as a reference source for understanding what the prevailing views are in science.

Reference

Thaxton, Charles, Walter Bradley, and Roger Olsen. 1984. The mystery of life's origin: reassessing current theories. Philosophical Library. New York.

LETTERS TO THE EDITOR

International Conference on Science and Belief

International Conference on Science and Belief, August 11-15, 1992: Pascal Centre, Redeemer College, Ancaster, ON Canada L9G 3N6: This five-day conference is planned for scholars with a professional interest in the relationship between science and belief. The first half of the conference will focus on general metaphysical beliefs while the second half will emphasize Christian beliefs.

Variation

These comments are prompted by Frank L. Marsh's excellent article "Biological Variation," (1991) and by Wayne Frair's challenge in "Original Kinds and Turtle Phylogeny" (1991). The case for the hybridization of the two *Spartina* species to make a third one appears to be well founded. However, it raises a question. I would like to hear Dr. Marsh's views, speculative though they would have to be, on the origin of the two **parent** species. Although Dr. Frair wrote about turtles, he put forth essentially the same challenge. What in a Biblical, creationist framework is truly the origin of *species?*

One could easily "solve" the origin problem by asserting that God created the two *Spartina* species separately, and that each was therefore a created "kind." This answer may well be the correct one, and there are probably creationists who hold this view. However, some creationists regard the boundaries of the baramins as being much broader than the species, and would think of the two *Spartina* species as the offspring of a single ancestral form. If the latter view is correct, there arises the question: By what genetic mechanism(s) did a species with 28 chromosome pairs and a species with 35 chromosome pairs arise from a single ancestral form?

Discussions of this sort become even more important when the animal kingdom is considered, especially dry-land animals. They have direct bearing on the number of animals in the ark and on the geographic distribution of animals in today's world. As an illustration, consider one aspect the familiar "kangaroo problem." Kangaroos and wallabies, found only in Australia, are very similar animals, classified (although inconsistently) into two distinct genera. Evolutionists seize on this example, and on all the Australian marsupials, for that matter, as proof of trans-generic evolution. Creationists have to give a "creationist" explanation. We must, at least, decide whether we can accept kangaroos and wallabies as a single created kind, descended from a single pair in the ark, or whether we must consider each of their species as a single created kind, each represented by a pair in the ark.

I am reminded of a bit of creationist history. How long has it been since any creationist writer wrote of the sterility of the mule as a proof of "after-its-kind" creation? Horse and donkey are different kinds, our writers used to tell us. Yes, they are similar in appearance, sufficiently so to allow both to be classified in the genus *Equus* and to allow limited hybridization, but obviously they are different kinds, as evidenced by the sterility of their hybrid. Therefore they prove that reproduction occurs only "after its kind"—or so we were told. Our writers never raised or tried to answer questions such as: Why is such hybridization possible at all? Why did God create two separate kinds, yet make them so similar that they could be crossed, albeit with sterility of the offspring? Today, not all of us would assert that all *Equus* species were separately created. We even see the suggestion from Dr. Frair that maybe ". . . turtles belong to a monotypic baramin . . .," although there are 250 living species of them (p. 23).

As a firmly committed creationist and close follower of the creationist movement, I have observed some real changes in creationist thinking in the past 40 years. Perhaps both evolutionists and creationists are getting more realistic about the world as it really is. Some evolutionists recognize the genuine systematic gaps in the fossil record, and respond with theories of