

Remarks by the President

A Louisiana law requiring a balanced treatment of both creation-science and evolution-science has been voted down this year by a majority of the Supreme Court. Creation-science was defined by the defense as "abrupt appearance in complex form" and, as such, did not include any reference to the Creator.

Even though the Creation Research Society is vitally concerned about this issue, it officially was not involved in the politico-legal maneuvers involving this case during the past six years because CRS is a scientific society. Our mission is research and publication.

We do believe, however, that the best interpretation of the facts from nature support the so called abrupt-appearance (or "kinds") model and we are endeavoring to establish this model within the scientific community. But additionally, we hold that the kinds were created by God and so we also are working within the scientific community to close the conceptual gap between the Creator and His creation.

Many leading scientists of previous centuries felt perfectly comfortable considering the Creator along with His creation. Now, our modern research tools may be different but people basically are not; so human nature needs the Christian message which not only helped set the stage for modern science but also meets the needs of individuals.

As we enter 1988 let us with renewed determination accept the challenge of utilizing the best scientific procedures in our thinking, research, speaking and writing for the glory of God.

Wayne Frair

Editorial Comments

At my request Dr. Eugene F. Chaffin prepared an in-depth literature review of the young earth concept. Dr. Chaffin reviewed all past Quarterlies and included some other creationist writings. The first in a series of two articles by John Meyer on another research project in which he is involved in the Grand Canyon is presented. Dr. Meyer reviews the history of a famous Shiva Temple exploration of about 50 years ago as an introduction to his work in that area.

The final selections in the minisymposium on orogeny organized by George Howe are in this issue. This topic is one of those which is of considerable interest to the Research Committee. Sedimentation, mountain and canyon formation should concern all creationists. Much study and research in these areas is necessary in developing the creation model of science.

Paul DuBois points out some misrepresentations of "Lucy" by anticreationists in his paper. Dr. Dudley Benton calls attention to some sloppy referencing practices and urges creationists to be more careful. As he discusses the young earth hypothesis, Dr. Benton also develops a model for the effects of nonuniform density on solar contraction energy.

Lawrence McGhee demonstrates that the mechanism of chance is detrimental to science and the understanding of the universe. Several Panorama of Science items and letters to the editor may be of interest to you. I wish that many of you would be willing to contribute to the Quarterly as well as to the research effort of the Society. Likely there are many research opportunities in your area and you could conduct a pilot study and write a preliminary report.

Emmett L. Williams, Editor

INVITED PAPER

A YOUNG EARTH?—A SURVEY OF DATING METHODS

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Abstract

A survey of various dating methods and age indicators is given, including Lord Kelvin's result involving the Earth's thermal gradient, various methods relying on radioactive decay, the relevance of the geologic column, carbon 14 and attempts to calibrate it using tree ring chronologies and Egyptian archaeology, etc., the Earth's decaying magnetic dipole moment, indicators from astronomy, fission track dating and other miscellaneous indicators. In each case, an effort is made to indicate the major creationist contributions that have been made in exposing the errors of evolutionary dogma.

Introduction: Lord Kelvin, the Earth's Thermal Regime, and the Early Days of Radioactive Dating

In the nineteenth century, before the discovery of radioactive dating methods, geologists felt that macroevolution would require at least hundreds of millions of years. Hence, great embarrassment resulted for some when Lord Kelvin published studies of the Earth's thermal regime. Eventually he concluded that the Earth's crust could not be older than about 40 million years and could be much younger (Slusher and Gamwell 1978). Although the rate of cooling of the Earth is extremely slow, and nearly 100 percent of any

original heat present when the Earth acquired its nearly spherical form must still be present, it nevertheless would require only a very short time, geologically speaking, for the modern thermal gradient present in the Earth's crust to be established. Regardless of the particular hypothesis of how the Earth formed, geologists were not able to explain Kelvin's results without resorting to special creation.

In the first decade of the twentieth century, Rutherford and Boltwood studied uranium-lead methods of radioactive dating and the age of the Earth leaped into the billion year time range (Badash 1968). In 1906 R. J. Strutt published studies of the amount of radioactive radium in various rocks and concluded that there should be more than enough radium present to account

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for the earth's internal heat (Strutt 1906). Today we know that when uranium, radium, potassium-40 and other radioactive materials decay, they emit charged particles such as alpha particles, energetic electrons or positrons, as well as gamma rays. In the process of giving up their energy, these particles plow through the surroundings, increasing the average kinetic energy of the atoms, hence increasing the temperature. Historically, it is said that Rutherford gave a lecture in London in 1904 at which Kelvin was present. Although he dozed during much of the talk, Kelvin was said to have awakened in time to be impressed when Rutherford claimed that the quantities of radioactive radium present in the Earth must supply enough heat to invalidate Kelvin's thermal regime studies.

Unfortunately, most geologists of the time were not very capable mathematicians, and were quite willing to blame Kelvin's results on the neglect of radioactivity. The same attitude of indifference to Kelvin's results seems to persist today. At the recent meeting of the American Physical Society in Crystal City, Virginia—April 1987, Lawrence Badash, a noted historian of physics, presented a lecture in which he described this early controversy. Unfortunately, he too described it as if the case were closed with the discovery of heat from radium (Badash 1987).

Nothing could be further from the truth. As early as 1908 doubts were raised as to whether radioactive heating was really such a large effect (Becker 1908). In 1955, while building a theory of Earth formation by gradual accumulation of a large number of comparatively small chunks of material, Hoyle attributed the degree of heating of the Earth by radioactive sources to be 1500°C at most (Hoyle 1955, p. 26). Part of the problem is that granite rock, such as occurs in continental crust, generally contains more radioactive material than the rocks of the ocean crust and no direct measurements can be made on the quantity of radioactive material in the Earth as a whole. Hence, only guesses based on meteorite compositions, etc. are possible. However, the best modern scholarship, exemplified by Slusher and Gamwell 1978, shows that Kelvin's problem still remains: the present rate of heat flow through the Earth's crust would have been reached in too small of a time span to be consistent with evolutionary chronology. Improvements in the data and calculational theory are still possible, though, if convection currents in the mantle prove to be significant (Bluth 1983, Anderson 1981). Further problems are that the temperature of the Earth's core has recently been pushed upward to 6900 ± 1000 K using new experimental data on the melting curve of iron (Q. Williams et al. 1987), while other data require certain diamonds formed in the mantle to have been crystallized at only 1200°C or less (Boyd and Gurney 1986). These latter developments make a long time scale more difficult to justify and support the young Earth position.

Radioactive Dating of Rocks

Rutherford and Boltwood's main problem was that although they introduced a dating method based on uranium and lead, their studies predated the discovery of isotopes and modern data on the abundances of different nuclides. They did not therefore know

enough about what had occurred and was occurring in the samples. Later in the twentieth century when we do have more information from over 80 years nuclear experimentation, many proposed radioactive dating methods are now discounted even by the evolutionists. The problems are leaching of daughter or parent nuclides from the rocks, diffusion of nuclides into the rocks, possible variations in isotopic abundance ratios over geologic time, uncertainties in decay constants and branching ratios, lack of reliable methods of determining how much daughter nuclide was already present in a rock at formation, etc. (Slusher 1973).

For the uranium-lead methods, "concordia diagrams" were introduced in the 1950s to graphically show "thermal events" which would reset a clock" (Wetherill 1956, 1963, Wasserburg 1963). However, many assumptions are needed to use the diagrams and interpretations giving essentially zero age are possible.

A method to which evolutionists seek to give great respect is potassium-argon dating. Clementson 1970, following the lead of Whitelaw 1968, 1969, Cook 1968, Armstrong 1966, Acrey 1965, Lammerts 1964, Morris and Whitcomb 1961 and no doubt many others, criticized this method and argued that it is impossible to adequately distinguish between argon 40 which was produced after a rock was formed and argon 40 which was carried with the magma and encapsulated with the potassium 40. Some classic work on Hawaiian lava known to have erupted in recent history, which nevertheless dated as geologically old rock, was cited as dramatic support of this idea (Noble and Naughton 1968). Similar arguments were made for the uranium-lead method, and supported by literature searches for isotopic data on volcanic rock of recent origin. Kofahl and Seagraves (1975 and 1984) have made further extensive studies along these lines. In particular they showed the vast discrepancies in "ages" given by potassium-argon and lead-thorium-uranium methods for volcanic rocks from Reunion Island. There seems to be a tendency in the technical literature to report only those ages which agree with pre-determined chronologies.

Possible variations in isotopic ratios over geologic time make suspect any method of correcting for initial amounts of decay products. Whitelaw (1969) argued that using the present 295.6 ratio of Ar-40/Ar-36 in the air to correct for initial Ar-40 is a questionable procedure, since this isotopic ratio is not necessarily constant in the Earth's magma and certainly not in the Earth's atmosphere due to cosmic rays and other changes such as outgassing from the Earth.

In the late 1970's an improvement in the accuracies of experimental techniques was made possible by the use of mass spectrometry. This made possible the detecting of individual atoms as a means of determination of atomic concentrations, rather than the older, less accurate technique of using radiation counters, spectrum analyzers, etc. This does not necessarily mean that more accurate ages are obtained, since the old assumptions involving initial isotopic ratios, leaching, etc. are still necessary. However, it does make very small concentrations accessible to measurement and allows application of the assumptions of radioactive dating in situations never imagined previously. For example,

Edwards et al. (1987) applied U-238, U-234, Th-230, and Th-232 measurements to coral to obtain ages ranging from 180 years to 125,500 years. M. J. Oard (1984a, 1984b, and 1985) has examined the theory of ice ages from a creationist perspective and his comments would be relevant to the theory of ice ages examined by Edwards et al. The dating method assumes that the Th-230/Th-232 ratio of sea water has been constant in time, an assumption which creationists might well question (on the basis of contamination of sea water caused by the deluge and/or the associated volcanic and crustal catastrophes). One sample, CH-8, dated by calibrated C-14 methods at 10,000 years was found to be 8294 ± 44 years old by the new uranium-thorium method. The authors had no explanation stating that the discrepancy merited serious thought.

A number of young Earth creationists: Gentry (1966, 1968, 1986), Kofahl and Seagraves (1975), DeYoung (1976), Morton (1982, 1983a, 1986), Schneider (1984) and Chaffin (1985) have felt that time variations in the so-called decay "constant" might be necessary to explain the data and correlate them with other phenomena. R.V. Gentry, an expert in the study of radioactive halos, has been saying this since the 1960's. In fact the story of radioactive halos goes back to Joly and the early 1900's, predating Rutherford and Boltwood. Joly was convinced that Boltwood's uranium-lead method gave too large an Earth age, not only from the study of halos, but also from studies of sedimentation and of the amount of sodium in the sea, both of which gave lower age estimates for the Earth (Badash 1968, Gentry 1974, 1986). Camping (1974) has shown that most elements other than sodium which have dissolved in the sea give much shorter age estimates of the sea. Morris (1975) reached similar conclusions. As Gentry (1973) has noted

Joly perhaps not realizing all the subtle factors which may influence radii sizes, announced in 1923 that U halo radii were indeed variable in rocks from different geological periods and suggested this was evidence for a change in λ .

Although Joly's experimental reasons for saying that halo radii indicate variable decay constant are now quite questionable, Gentry has proposed that halo radii could be nearly constant and the decay constant still be variable (Gentry 1966, 1968, 1974 footnote 16). His discovery of polonium halos in granite indicates a young Earth and possible variable decay constant for different reasons. The problem is that the polonium halos in question result from isotopes of very short half life and there are no old Earth cosmological models which can successfully explain this in the face of Gentry's extensive experimental results using ion microprobe, x-ray fluorescence and other modern techniques. Also, Gentry's study of secondary halos in coalified wood indicates they formed in normal ways but that old Earth models of the formation of the fossilized wood are not adequate. Instead, Gentry finds that uranium to lead ratios in the halo inclusions indicate they are only several thousand years old instead of the 60 to 200 million year age required by evolutionary epoch schemes and that furthermore the flexibility of freshly collected coalified fragments indicates rapid deposition and coalification—such as

would occur in a worldwide flood (Gentry 1986 pp. 51-59, Connor 1977).

Glenn R. Morton has gradually developed a model of Earth history which involves variable permittivity of free space and hence a variable decay constant λ (Morton 1981, 1982, 1983a, 1986). The "permittivity of free space" is a "constant" appearing in Coulomb's law of electrostatics. In the 1982 paper, he discussed the problem of the "missing isotopes." Isotopes with half lives less than a million years are either non-existent naturally or if they do exist can be explained as products of natural nuclear reactions or nuclear decays of longer lived isotopes. The existence of such short lived isotopes in quantity would be hazardous to life, which might be why the Creator omitted them. However, this creates an appearance of age and Morton argued that it might be more likely that decay "constants" changed in an episodic manner, resulting in more rapid decay for a short period, followed by modern rates of decay. This more rapid decay would remove the short lived isotopes. Morton showed by dimensional analysis that the decay constant λ should be proportional to $1/\epsilon_0^2$ where ϵ_0 is the permittivity of free space. Hence the variability of the permittivity of free space is equivalent to variability of the decay constant.

Akridge (1983) in a letter to the editor objected that "within the framework of classical electrodynamics" a variable permittivity of free space would violate the principle of conservation of energy and would result in light from distant stars being too dim. However, the admission of variable permittivity of free space takes us out of the realm of classical electrodynamics, since Maxwell and the other nineteenth century framers of the theory never had reason to consider such a secondary effect. It is not difficult to fashion field theories which conserve energy but yet allow the strength of electric forces to vary relative to gravitational ones. An example is given in Dirac (1973). In Dirac's theory, which is similar to the scalar-tensor theory of gravity of R. H. Dicke, there is a scalar field β which can absorb or give back energy and momentum. Only experiment can decide the correct theory and further work is needed to develop a consistent picture.

Setterfield (1981) gave an analysis of measurements of the speed of light showing that they displayed a statistical tendency to decrease as time progressed. However, his mathematical treatment could be questioned at points. For example, his value for the speed of light inferred from measurements by Roemer in the 1670's is not supported by the original data (Goldstein et al. 1973).

Morton's thoughts led rather naturally to the "outrageous hypothesis" that the Earth's radius has expanded (Morton 1983a). Morton used models from solid state theory to show that a change in the permittivity of free space would cause a differential expansion of the Earth. This is not quite the same as continental drift, which he had shown in an earlier article does not fit very convincingly into creationist time frames (Morton 1981). Instead, the Earth expansion hypothesis is one receiving some respect in conventional geology, but which Morton adapted to young Earth creationism. The continents almost seem to fit together like a jig saw puzzle on an Earth about 55 percent of its present

radius. Hence, Morton hypothesizes a sialic covering for the earth, which would crack apart and separate about the time of the Genesis Flood, due to God's modification of the permittivity of free space. This would involve greater repulsion between protons in the nucleus, increasing radioactive decay rates and a decrease in density of solid rocks due to mutual repulsion of electrons winning out over attraction of the nucleus for the electrons. Morton showed that granite would under these conditions expand less than the interior of the Earth and the ratio of land to water would consequently change. Baumgardner (1981) reached a similar conclusion. Unfred (1986), considering the topography of the Earth's surface, found much more that could be explained with this model.

Chaffin (1985), in studying the Oklo natural uranium reactor, found much that could possibly be better explained about the distributions of uranium 235, uranium 238 and the various neodymium and samarium isotopes if the relative strength of the Coulomb field could change, shifting the fission mass yield curve.

Radiometric Dating and the Geologic Column

One aspect of the young Earth-old Earth argument which must be addressed is whether the geologic column correlates with radiometric dating. In the creationist-diluvialist paradigm the geologic column, which was historically invented by diluvialists in the 1800's, must represent different types of sedimentation laid down largely during the Genesis Flood. Morton (1982, 1984, 1986) makes a case for further episodes of catastrophism following the Flood. Morton's recent book (1986) puts the age of the Earth at 125,000 years or more. This is squared with the Scriptures by assuming that gaps exist in the genealogies of Genesis, a view which was considered by Schaeffer (1972) with contrary evidence or rebuttal given by Whitcomb and Morris (1961), Whitelaw (1970), Strickling (1973), van der Werf (1977), Hanson (1977), Dillow (1981), Niessen (1982, 1984), Osgood (1984) and Seaver (1985). Morton arrived at the 125,000 year date by an estimate of the age of the Green River laminated formations in Wyoming and Colorado. Needless to say, it would take many omissions in the genealogies to push the age up to 125,000 years and this does not seem very plausible. Morton needs the larger age to justify what are considered to be world wide systems of geologic strata on the basis of post-Flood deposition. Nevins (1974) also considered extensive post-Flood deposition to be necessary, but not on as extensive a scale as Morton. In any case, whether post-Flood deposition is needed or not, there must be inherent scatter in the results of radiometric dating if the billions of years evolutionary paradigm is incorrect.

If radiometric dating, however inaccurate in detail, is correct in showing that lower beds of sedimentation must be millions of years older than higher beds of sedimentation, then the young Earth model would be wrong. Woodmorappe (1979) gave a voluminous study of the correlation or non-correlation of radiometric dating and the geologic column. He found that dates reported by evolutionists in the scientific literature often deviated by hundreds of millions of years or more from the supposed time frame of the geologic

period. We must realize that dates which are vastly different would not normally be reported in the literature, since the evolutionist would consider them inaccurate. This is evident from the cases which Woodmorappe documents where ages which agree with the geological column's time frame are accepted in spite of alteration of the rocks, while ages of other rocks are considered discrepant in spite of no obvious marks of alteration of the rocks. It thus becomes apparent that an objective, statistical and unbiased study of radiometric dating and its correlation or non-correlation with the geologic column is not possible if we can only rely on data published to date in the technical literature.

Woodmorappe's work thus justifies the view that radiometric dating does not prove the uniformitarian timetable, since the radiometric methods must be supplemented by many hypotheses involving reheating, leaching, cleavage, etc. in order to support the uniformitarian concepts (Woodmorappe 1983a, b, 1985a, b). Morton would possibly be able, using his variable decay rate hypotheses, to explain any trend, through the geologic column, in radiometric dates that might exist. However, Woodmorappe and Mehlert (1983, 1986) seem unconvinced of the existence of this "trend" but that if it exists it could be explained otherwise. Woodmorappe (1983b) mentioned rates of formation of magma with resulting degrees of entrapment of argon as a way of explaining potassium-argon biostratigraphic trends.

Carbon 14 Dating

This seems to have been a very popular subject in the Quarterly pages. Since the first Annual in 1964, no less than 23 papers have appeared along with numerous Panorama of Science items, letters, etc., all majoring on this subject.

The method of carbon 14 dating was discovered by W. F. Libby in the 1940s for which he received the Nobel Prize in chemistry in 1960. Carbon 14 is a radioactive isotope of carbon with a half life of 5730 years. It is produced in the upper atmosphere by bombardment of nitrogen 14 by neutrons from cosmic rays. It then slowly becomes distributed throughout the atmosphere, oceans, biological life and soil of the Earth. When an organism dies, it will under certain conditions stop exchanging carbon with the surroundings. If the activity of the surroundings at the time of death is known, it then becomes a simple problem in mathematics to calculate the age of the sample. However, as both evolutionists and creationists have increasingly found, the hypotheses necessary to give the concentration of C-14 at the time of death have become increasingly complex.

At first Libby assumed that the production rate of carbon 14 in the atmosphere was equal to the decay rate in the exchange reservoir as a whole. After a couple of decades under fire, this assumption had to be dropped in favor of "calibration" techniques using tree rings (dendrochronology) and historical/archaeological data. Libby knew from the first that the production rate of carbon 14 was not equal to the loss rate. But he assumed that the difference was due to experimental error and was believed. So much was he believed that all of ancient history was thrown into shambles and

some former "experts" in the study of ancient times were subject to ridicule or were conveniently ignored.

Creationists appear to have been aware of Libby's misguided assumptions from the early years forward. Moore (1964) cites an article of 1959 by F. L. Marsh while Hefferlin (1972) cites a 1953 article by Woods and a 1957 article by Gentry. Armstrong (1966) and Wood (1966) noticed the absence of carbon 14 in most samples of coal and concluded that the Genesis Flood must have initiated an increase in the C-14 concentrations in the atmosphere. Wood stated that a vapor canopy and/or the Earth's magnetic field may have shielded the atmosphere from cosmic rays. Armstrong attempted to give a calibration curve using the human lifespans given in Genesis 11. A re-evaluation of this problem and a new curve were given by Strickling in 1973. Wiant (1966) pointed out the compression of the history of early man that resulted from Libby's technique, while he and Harris (1966) pointed out some of the possible inaccuracies in the technique due to contamination by rootlets, limestone soil, industrial exhaust, airport exhausts, etc. Many if not all of these points were discussed by Whitcomb and Morris (1961) in their landmark book giving a comprehensive, Biblically based history of the Earth and the effects of the Genesis Flood.

Cook (1966) published a book which contained unorthodox views of Earth history, including critiques of radiometric dating techniques. Cook recognized that the Earth's atmosphere is not in a steady state, in that the production rate of C-14 is not equal to the loss rate, in spite of the fact that it would take only about 30,000 years to reach equilibrium. He discusses the effects of the industrial revolution (burning of fossil fuels) and nuclear weapons testing on the carbon exchange reservoir. He attempts to build a picture of Earth history by investigating glaciation, former ice caps and the theory of continental drift. The book is unorthodox in that Cook considers the Earth's age to be indeterminant, hence the viewpoint taken is not entirely in accord with Biblical statements. But nevertheless the "geological column" is considered to be of recent origin.

In 1968 and 1970 Cook published articles in the *Creation Research Society Quarterly* discussing the changes in estimates of production and loss rates of C-14 and Libby's development of the hypothesis that some carbon 14 is irretrievably deposited in ocean bottom sediments and that this is exactly the amount needed to account for non-equilibrium. Cook discussed the anomalous result that the percentage of dolomite versus calcium carbonate found in the geologic column increases toward the bottom of the column. He gave an interpretation in terms of a Flood model. He proceeded to analyze Libby's hypothesis, concluding that the sedimentation rate required to sustain Libby's conjecture would be 130 times that of conventional historical geology and that similar questions involving time scaling were apparently unanswerable.

Brown (1968) described the "art" of carbon 14 dating as it was practiced at the time and attempted to quantify the carbon-14 activity level prior to the Flood, effect of the changes in the Earth's magnetic field, the effect of a water vapor canopy prior to the Flood, the

effect of the conversion of carbon to carbonates during the Flood and other relevant factors.

Whitelaw (1968, 1969, 1970, 1975), rather than merely taking the defensive and explaining how the radiocarbon data could be explained in terms of a young Earth, took the offensive by interpretation of data published in the journal *Radiocarbon* in terms of a specific young Earth-diluvialist model. He assumed a higher production rate of carbon 14 in the upper atmosphere prior to the Flood, but that the initial carbon 14 concentration at creation was zero or very small. By grouping carbon 14 dates into 500 year intervals, he constructed graphs showing remarkable discontinuities at the expected time of the Genesis Flood. Thus a very dramatic confirmation of Biblical history was achieved.

White (1972) discussed variations of carbon 14 content in the atmosphere and also explained the large concentration of helium 3 in terms of a pre-Flood vapor canopy. Dillow (1981) discussed the same problem in his very interesting book on the vapor canopy.

While the possibility of a variation of decay "constants" has been considered at times, Gentry (1968), Dudley (1975), DeYoung (1976, 1978), no one had considered what this would do to interpretation of carbon 14 data, since the manner in which decay constants would have varied over time would have to be specified. Hefferlin (1972) attempted a mathematical treatment of how such a problem could be handled. Hanson (1976) also considered such a problem and also solved a hypothetical variable carbon 14 concentration model to show how uniformitarian prejudices are involved in conventional interpretations. Thirdly, Hanson also considered the fact that in ordinary treatments of "exponential decay" the probability of more than one decay in a small time interval is considered negligible. He then presented a solution of the Chapman-Kolmogorov equations to show what modifications result.

All these papers discussed up to now could be characterized as recognitions of the discontinuity caused by the Genesis Flood and hence the resulting compatibility of radiocarbon data with the Biblical history. The gross features of the creation alternative thus were outlined. The more recent works by creationists do not depart from these discoveries but they deal with so-called "calibrations" based on dendrochronology, Egyptian history, prehistoric digs, archaeological finds, etc. See Long (1973), Clementson (1974); Brown (1975, 1979), Sorensen (1976), Tyler (1977, 1978, 1979), Gladwin (1978), Lee (1982), Lammerts (1983), Vaninger (1985) and Johns (1986). In the case of dendrochronology, these authors have handled the circular reasoning necessary to cross match tree ring patterns from different tree specimens, the tossing aside of "complacent specimens," difficulties with laboratories refusing to make their actual data available, multiple rings possibly produced in a year and the admitted conflict with both radiocarbon results and Egyptian chronologies. The Egyptian chronologies conventionally used were constructed with an anti-Biblical, evolutionary bias. They depend on almost mystical interpretations of Egyptian history, such as the 1460 year "Sothic period," a cycle based on the rising of the star Sirius, which purportedly gives a

forced fit of archaeological finds in determining the dates of various Egyptian dynasties. Tyler (1978) gave a discussion and mathematical analysis which described the interface between radiocarbon and other data. He extended Cook's 1970 discussion of the geological absurdities involved in Libby's 1965 attempt to use ocean bottom sedimentation to explain non-equilibrium. Brown (1979) raised the question of how the radiocarbon concentration could rise to the present 70 percent of equilibrium in the short time span allotted to young Earth creationists. Tyler (1979) replied by discussing the time scales involved in exchanging carbon between the atmosphere, surface ocean, deep ocean, and other parts of the carbon exchange reservoir. Due to the negligible activity radiocarbon would have when its concentration is small, Tyler correctly stated that, if the atmosphere were isolated from the oceans, it would take only about 100 years for cosmic ray bombardment to build up the concentration from zero to its present value. With the oceans involved, the effect of the Genesis Flood must be considered. Hence, the Flood can again be used to demonstrate the short chronology involved in increasing the concentration from the very small pre-Flood levels demonstrated by most coal and oil to the present day values.

Decay of the Earth's Magnetic Field

Moving charges produce magnetic fields. All magnetic fields appear to be due either to changing electric fields, moving electric charges or electronic and nuclear magnetic moments. Compared to the other inner planets of the solar system, the Earth has a very large magnetic field. Since the crust and upper portions of the Earth contain very little permanent magnetism, and the inner portions of the Earth are above the Curie temperature of all known ferromagnetic materials, the magnetic field of the Earth must be due to electric currents in the interior and not to permanent magnetism.

In 1883 Sir Horace Lamb presented a theory of the Earth's magnetic field in which it would be due to electric currents circulating in rings around the Earth's magnetic axis and would decay with time due to resistive heating losses. In 1971 Thomas G. Barnes compiled real time data and estimates of properties of the Earth's core to give the numbers needed to apply Lamb's theory. If we interpret the data in terms of a half-life, the value is about 1400 years.

The old Earth, evolutionary description cannot be valid if the magnetic field decays according to the Lamb-Barnes theory. Only a few thousand years ago the magnetic field of the Earth would have been unreasonably large. This presents no problem if the Earth were created only a few thousand years ago, but evolutionists cannot accept this. That is why they insist on a dynamo theory for the Earth's magnetism, as opposed to the Barnes-Lamb theory. In the dynamo theory, fluid motions in the core are supposed to generate electric currents, hence also magnetic fields. In contrast to the Barnes-Lamb theory, evolutionists do not have an exact mechanism to generate a field of the shape and symmetry of the Earth's field. Akridge (1980) showed that the Faraday disk dynamo does not provide a model including the field reversals which the evolutionists need. Barnes (1971, 1972, 1973a, 1973b, 1975, 1981, 1982, 1984, 1986) has consistently main-

tained that remanent magnetism reversals in the Earth's crustal rocks can be explained by other physical and chemical factors than a reversal of the Earth's dipole moment. To quote Barnes (1982, p. 197):

The present status of evolutionary 'evidence' for the presumed reversals of the Earth's dipole magnet is as if geologists were to set up thermometers all over Mount St. Helens volcano region and from these temperatures (regional) claim to show worldwide oscillations/fluctuations in the global temperatures of the Earth.

Barnes is correct. A June 1987 *Physics Today* news item tells of the American Geophysical Union honoring George E. Backus in 1986.

In geomagnetic studies in the late 1960's Backus showed that the flow at the core-mantle boundary could not be uniquely determined for surface magnetic data, as had been thought, . . .

This seems to mean that, if there is not enough data available, more than one model will be able to explain the data. Weisburd (1987) in fact tells of some recent work by Bloxham and Gubbins (1987) in which a dynamo model of the Earth's core, plus the geomagnetic data, are used to map the magnetic field at the core-mantle boundary. C. V. Voorhies is quoted as saying that the model is: "... extremely speculative and by no means proven." The evolutionists are *trying* to explain the decrease in the Earth's dipole moment as due to intensifying core spots, which produce a magnetic field in a sense opposite to that of the main dipole. But it should be mentioned that it is a complicated, non-symmetric pattern of convective rolls that they are forced to accept and there is no real proof that these patterns are any more than speculation.

While the evolutionary theories of geomagnetism are too complicated to be predictive as regards the future, Barnes' model predicts a continued decrease in the Earth's main dipole. Humphreys (1983, 1984) on the other hand has found a hypothesis for the origin of geomagnetism which is Biblically based and also successfully predicted the order of magnitude of the magnetic field of the planet Uranus (Humphreys 1986). The January 20, 1986 Voyager 2 flyby of Uranus gave a value of the magnetic dipole moment in agreement with Humphreys's 1984 hypothesis.

Indirect Dating from Astronomy

Evidence from astronomy that gives a young age for the solar system, Milky Way galaxy or the universe indirectly implies a young age for the Earth.

For example, Slusher (1971), Armstrong (1971), Steveson (1974), Samec (1975) and Steidl (1987) have considered comets as indicators of the age of the solar system. Armstrong considered the problem of close encounters between comets and large planets, as an example in celestial mechanics. He concluded that, statistically speaking, the comets should speed up more often than they slow down as a result of these encounters and should be lost from the solar system. There is very little evidence for the existence of the hypothetical Oort cloud, hence if the solar system is as old as it is claimed to be, how could any long-period comets be left? A second reason for taking this viewpoint is that comets lose much of their mass each time they approach the sun.

Other indirect evidence involves discussing the intractability of the evolutionary theories of the origin of the solar system or of the big bang paradigm. Mulfinger (1967), Whitcomb (1967, 1976), Akridge (1980) and Slusher (1978) have discussed the origin of the solar system. DeYoung and Whitcomb (1978) concentrated on the moon, showing that thermal and geological activity, failure of radiometric dating, lack of significant depths of lunar dust, etc. all point to a young moon. St. Peter (1974), Akridge (1982, 1983), Schneider (1984), Bouw (1977, 1982), Slusher (1978c) and Gentry (1983, 1986) have pointed out flaws in the big bang theory of the origin of the universe.

Mulfinger (1970) gave a critique of theories of stellar evolution. Hinderliter (1980a, b), Hanson (1981), West (1981), and Steidl (1980) have discussed gravitational collapse or the shrinking sun hypothesis as a serious alternative to stellar nuclear processes as a source of the energy of stars. The reason that evolutionists cannot accept the gravitational collapse theory is that it would not provide enough energy to last the billions of years they need. Nevertheless observations show the sun is shrinking (Lubkin 1979). Hans Bethe, who received the 1967 Nobel Prize in physics for his studies of nuclear processes in stars, recently stated (question and answer session at the Crystal City, Virginia, American Physical Society meeting, April 1987) that he considers oscillations between electron, muon and tau neutrinos to be the solution to the solar neutrino problem. Clearly, if he is wrong, Steidl (1980) and others have already furnished creationist models to show why.

Miscellaneous

A few other dating procedures are mentioned. Fission track dating is a method whereby microscopic tracks in solids, produced by fission fragments, are counted to determine age of a rock. Macdougall (1976) pointed out that extraterrestrial samples such as moon rocks and meteorites give anomalously large ages by this method, attributed to tracks produced by cosmic rays. He says that attempts to surmount this difficulty have been made by choosing samples with a higher than average uranium content and taking samples located at least 10 cm below a surface. But even then it is not uncommon to find ages much greater than the supposed 4.6 billion year supposed age of the solar system. This is attributed to the initial presence of Pu-244 in the sample, an isotope with a half life of 82 million years and both alpha decay and spontaneous fission decay modes. The uranium and plutonium fission tracks are said to be physically indistinguishable. It is supposed that the Pu-244 would have decayed away and its fission tracks annealed away during the supposed millions of years it took the Earth to form, so that Pu-244 tracks would not be a factor in terrestrial materials. It seems to me that this assumption cannot be granted in a young Earth model. Tracks of other nuclides with shorter half lives (such as Cf-254, Pu-238, and Pu-236 with half lives of 60.5 days, 87.74 years and 2.85 years, respectively) would have to be considered. The nuclide responsible would have to produce the correct fission mass yield spectrum (Matthews and Kappeler 1984 or Kuroda 1982). Hence fission track ages are not conclusive evidence against a young Earth model.

Signs at Carlsbad Caverns or other caves sometimes indicate that the size of stalactite and stalagmite Formations can be used to date the formation. Both evolutionists and creationists who have seriously studied the problem have concluded that this is not necessarily true. Keithley (1971), Brauer (1972), Brady (1973) and a host of others listed by Williams (1987) have reported man made structures which have rapidly grown stalactites. In 1975 the author personally observed stalactites on the order of a foot long in an old bombed out World War II bunker alongside a country road west of Karlsruhe, Germany. I was told later that it was foolhardy to crawl around in such structures, due to the possibility of unexploded ordinance. Williams, Herdklotz and others have performed extensive experiments showing the drop in pressure and other conditions necessary for rapid formation of these structures (Williams et al. 1976, 1977, 1978, 1981).

Conclusion

This study shows that there are still educated people alive today who are willing to defend Biblical authority on the subject of the age of the Earth and that very reasonable defenses can be made.

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'LUCY' OUT OF CONTEXT: A REPLY

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Abstract

Anti-creationists do not always adhere to the standards they demand of creationists.

Introduction

In " 'Lucy' out of Context," published in *The Skeptical Inquirer*, Leon Albert (1985) voices his concern over the incidence of out of context quoting in creationist literature. He discusses the creationist claim that the australopithecines are not prehuman, particularly *Australopithecus afarensis*, the species to which 'Lucy' belongs. His report is an enthusiastic indictment and does raise some important issues, particularly the

tendency of creationists to apply to *A. afarensis* statements made about other australopithecine forms with little or no justification for the generalization. However, it also conveys the impression that virtually all creationists are guilty of blatant errors no self-respecting evolutionist would ever commit, which is highly misleading. Albert himself commits most of the errors he catalogs as part of the creationist repertoire. His own article is thus an excellent example of the fact that greater care needs to be taken in evaluation of these fossils—and the literature pertaining to them—by non-creationists as well.

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