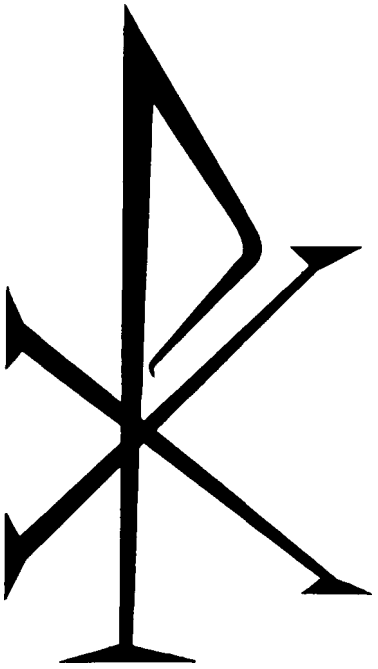
# CREATION RESEARCH SOCIETY

## QUARTERLY



**Haec credimus:**

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

**VOLUME 5** **SEPTEMBER, 1968** **NUMBER 2**

# CREATION RESEARCH SOCIETY QUARTERLY

VOLUME 5 | SEPTEMBER, 1968 | NUMBER 2



* All manuscripts submitted should follow Style Format published in Vol. 4 (Dec.), p. 88 *

Notices of change of address, and failure to receive publication should be sent to Wilbert H. Rusch, Sr., 2717 Cranbrook Road, Ann Arbor, Michigan 48104.

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## EDITORIAL COMMENTS

Can the age of stratified rocks and fossils really be estimated by the various radioactivity-dating techniques? Is radiocarbon dating valid? Usually popular articles give affirmative answers. We therefore thought it timely to devote this *Quarterly* to a careful examination of various methods used and validity of dates reported.

The article by Professor R. H. Brown has been placed first since it is the easiest one to read and gives much of the background thinking involved in radiocarbon dating. His discussion of the first appearance of farming and its rapid spread in only 1200 radiocarbon "years" is fascinating.

Dr. Melvin A. Cook has done much original work on radiological dating. His non-equilibrium model of Carbon-14 formation and decay bring the results of radiocarbon dating much closer to Bible chronology. Also, his examination of the uranium-thorium-lead, potassium-argon, and rubidium-strontium methods is highly critical of their validity.

Professor Robert L. Whitelaw suggests a somewhat different possible explanation for the non-equilibrium of Carbon-14 than does Dr. Melvin Cook, but shows the same effect of reducing age-estimates arrived at by Carbon-14 dating. His detailed discussion of potassium-argon dating is a splendid supplement to that of Dr. Cook.

Robert W. Gentry presents a review of some of his own research on pleochroic halos in relation to the possibility of a variation in the decay constant. He concludes that the rate of radioactive decay was probably greater at some time in the past than now.

Dr. Harold G. Coffin shows rather clearly from a study of the marine tubeworm, *Spirorbis,* that coal resulted from transported deposition of plant remains. The usual uniformitarian explanation is that coal resulted from the accumulation of plant materials in fresh-water swamps and marshes over long periods of time.

Harold Armstrong again presents his always-interesting reaction to various news items, showing how they may be related to the creation world view.

Finally, we are indeed pleased to have a student, E. Norbert Smith, submit a very pertinent review of a paper on experiments with changing eye-ring color in sea gulls.

We are also very glad to welcome four new authors in this *Quarterly:* Dr. Cook. Professors Brown and Whitelaw, and Dr. Coffin. It is hoped that more members of our society will submit reviews and reactions to scientific articles bearing on creation vs. evolution and catastrophism vs. uniformitarianism.

--WALTER E. LAMMERTS
*Editor*

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## OPEN LETTER

September, 1968

Dear Member or Friend of the Creation Research Society:

Last year the Creation Research Society established a research committee to approve research projects and solicit funds for the support of Creationistic studies. The Lord has blessed this effort and contributions to this fund are over $700 so far.

The first project approved for research support was a geophysical and paleontological analysis of a supposed thrust fault in the Empire Mountain Range near Tucson, Arizona, where Permian rocks overlie Cretaceus rocks. The project has been planned by Harold Slusher (geophysicist at the University of Texas in El Paso) and Clifford Burdick (consulting geologist in Tucson), and should demonstrate by geophysical techniques whether or not a thrust fault is actually possible at this location. (See C.R.S. *Quarterly,* December, 1967, Vol. 4, No. 3, p. 87, for details). Project cost is estimated at approximately $1300 for supplies and equipment. Since over half of this amount has been received. the committee has advised the men to proceed.

We now need to lay this burden of research funds before you once again. The project can be completed with the contribution of $600 more. If we go above that amount, new studies can be initiated. As you know, very few scientists favor the creation truth of Genesis and fewer still are actually willing to study, do research and write with this view as their basis in science. Here then is your chance to use some of the Lord's money in support of a truly unique and urgently needed ministry.

Should the Lord lead you to help in this way, please send all contributions to Professor Richard G. Korthals, Treasurer, 2678 Page Avenue, Ann Arbor, Michigan, 48104. Mark your gift for the "Research Fund."

Yours in Christ,
GEORGE F. HOWE
Chairman, Research Committee

## COMMENTS FROM THE PRESIDENT

A number of years ago, when I was teaching at another university, I had fairly frequent contact with a faculty colleague who professed to be an atheist. In spite of his anti-Christian attitudes, however, he did join one of the prominent churches in the city. The moral training would be valuable for his children, he said.

I was in hopes that this might imply an incipient interest in spiritual matters on his part and so began to try to witness to him, desiring to lead him to Christ if possible. We had many interesting conversations, but he seemed to have no end of intellectual objections to the Gospel. I suggested that he read some good books on Christian evidences and he agreed to do this. I remember in particular giving him Wilbur Smith's *The Supernaturalness of Christ* and Irwin Linton's *A Lawyer Examines the Bible.*

A week or so later he returned the books and was quite visibly perturbed. I asked him if he had read them, and he said he had read about half of each, but was not going to finish them. Of course, I asked, "But why?' He answered, emphatically: "I don't care how strong the evidences are, I don't want to believe in Christ and I'm not going to!" And that was that.

My experience, for whatever it is worth, is that most scientific and intellectual problems that seem to keep people from accepting God's Word are, in reality, spiritual problems. It is good and necessary to deal, as carefully and scientifically as we can, with the evolution-creation question and other issues, but only "God giveth the increase." Most committed evolutionists are evolutionists because they want to be, not because of the scientific evidence itself. Evolution is in reality a religion and is fundamentally therefore a spiritual, rather than a scientific, problem.

I believe that the Creation Research Society is demonstrating that Biblical creationism is a more powerful and comprehensive framework within which to study and understand the universe than evolutionary uniformitarianism can ever be. This continuing demonstration will serve to strip away the pseudo-scientific aura surrounding the evolutionary philosophy, and thus to confront men with the necessity of a clearcut spiritual decision between evolution and creation as the ultimate foundation of life and meaning.

For the many who are still truly open-minded and open-hearted on the issue, the greatest single stumbling block has undoubtedly been the supposed great age of the earth and the system of geological ages developed by Lyell and others many years ago.

It is impossible to harmonize the idea of over a billion years of struggle, disease, storm, decay, disorder and death leading up finally to man, as supposedly evidenced in the fossil record which defines these geological ages, with the revelation of an omnipotent, all-wise, and all-merciful God who "doeth all things well."

The idea of a billion-year reign of confusion and death in the world before man (or even Satan!) ever sinned, implicitly identifies God Himself as the direct Author of confusion and death. But this is theological chaos! One can hardly escape the conclusion that the geological ages and the God of the Bible are mutually exclusive concepts.

But the evidences for the geological ages and Earths great antiquity are really quite fragile after all! Articles in this *Quarterly*, and references cited therein, effectively point out some of the extremely unrealistic assumptions on which geologic time estimates are based. There is therefore no reason whatever why people should feel compelled to believe in the standard system of geological ages and the evolutionary system which is essentially synonymous with it. The simple Biblical framework–special creation. the fall, the curse, the flood-are found to correlate the actual data with much greater effectiveness and far fewer difficulties.

A person's final decision, however, must basically be a spiritual decision. Recognition of the fact of creation and the fall inescapably points also to the need of the Saviour. And at this point a man is all alone with his Creator and Redeemer.

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## NEWS NOTE

Three members of the Creation Research Society, Dr. Joseph Henson (biology), Dr. Emmett Williams (chemistry) and Mr. George Mulfinger (physics) present a weekly radio program called "The Bible and Modern Science" during which they defend the creation position and attack the evolution position.

This program is now carried by WMUU of Greenville, South Carolina; WAVO of Atlanta, Georgia; and KCAM of Glenallen, Alaska. These programs are produced for 15 minutes radio time. The actual tapes run about 12 minutes each.

The program is moderated by Dr. Henson and a wide variety of topics in the areas of biology,

*(Continued on Page 87)*

# RADIOCARBON DATING†

R. H. BROWN*

*A summary of the physical phenomena involved in radiocarbon dating is given. Laboratory procedure determines the amount of radioactiue carbon a sample contains now. Calculation of an age requires an* ***assumption*** *concerning the relative amount of radioactive carbon in the environment at the time the organism from which sample was derived was living. The year A.D. 1850 is chosen as a standard since up to then man had not contaminated the air by either adding carbon dioxide from industrial fuel or neutrons from atomic explosions. Thus a decrease to one half of the amount found in A.D. 1850 samples indicates a radiocarbon age of 5730 years. Correlation with tree-ring dating shows a fair degree of accuracy to about 59 B.C. Attempts to correlate Bristlecone Pine growth-rings with radiocarbon age show a discrepancy of 500 to 1000 years, the pine ages being that much older than Carbon-14 ages. Reliable conversion between historical age and radiocarbon age goes back only 3-4000 years. Though only approximations, farming increased rapidly in 1200 "years" from 7,200 to 5,000 B.P. Evidently prior to the Flood the relative amount of Carbon-14 in the air was only about* $^{1}/_{1000}$ *of its present value. Several theories for increase in Carbon-14 are given.*

## Introduction

It is common knowledge that radiocarbon laboratories have determined ages for organic material which in a vast number of cases appear to be in conflict with the specifications concerning Earth history given by the book of Genesis and endorsed by the Gospel writers and the apostle Paul in the New Testament. There is an evident need for intensive and careful study in the broad field of radiocarbon dating in order to find the agreement that we have been assured exists between the book of nature and the written Word.

In approaching any body of scientific literature it is well to keep in mind the unavoidable tendency of an investigator to harmonize the information available to him with his general world view. The human mind is designed to integrate and summarize its observations into generalized principles and viewpoints. This characteristic is necessary for the development of understanding and capability. As a consequence of their cultural and educational background, most of the radiocarbon specialists have a world view that is based on uniformitarianism and progressive evolutionary development of life.

In using some of the information provided by Carbon-14 analysis, the seeker for truth who begins with the commonly accepted uniformitarian viewpoint may experience a more difficult and devious path toward a fuller understanding than would have been the case if his initial viewpoints had conformed with the guidelines set forth in the Bible. Where scientific observation relates to the divinely inspired testimony, we have been assured that an honest search for truth will result in both increased understanding and in confirmation of the inspired testimony.

Individuals who are leaders in the development and application of Carbon-14 dating techniques are men and women of high ideals, who are intensely devoted to finding truth in their areas of investigation and are meticulous in maintaining a distinction between speculation and firmly substantiated evidence. However, with Carbon-14 dating, as in many other areas of human thought, the dogmatism with which speculative conclusions are advocated commonly increases with the distance one goes from prime sources of information.

## Survey of Physical Phenomena

Before considering some recent developments on radiocarbon dating, many readers may appreciate a brief survey of the physical phenomena involved. Stars eject into space some of the matter of which they are composed. This ejected matter represents the chemical composition of its parent star and, consequently, is made up of hydrogen, small amounts of helium, and traces of more complex atoms.

Some of the atoms in this ejected matter are affected by forces which strip away the outer negative electric charge (electrons) and accelerate the positively charged nucleus to extremely high speeds. These high speed atomic nuclei which drift around through interstellar space are called primary cosmic rays.

Earth is constantly bombarded from all directions with primary cosmic ray particles. These particles have sufficient energy to break up atoms which they encounter on reaching the upper levels of the Earths atmosphere. The break-up of nitrogen and oxygen atoms by primary cosmic rays produces neutrons and atoms of carbon, boron, beryllium, helium, hydrogen and possibly lithium.

Neutrons are uniquely effective agents for producing atomic transmutation. The most frequent reaction produced by neutrons in air transmutes nitrogen into carbon which has 14 units of mass as compared with the 12 units characteristic of ordinary carbon ( 16½ percent heavier than an

*R. H. Brown is Professor of Physics at Walla Walla College, Walla Walla, Washington.

†Portions of this article appear in chapter form in the forthcoming book, *Creation–Accident or Design?* by Harold G. Coffin, Research Professor at the Geoscience Research Institute, Andrews University, Andrews, Michigan 49104.

ordinary carbon atom), and is radioactive (that is, unstable). In the order of 22 pounds of radioactive carbon are produced per year in the Earth's upper atmosphere as a result of reactions produced by primary cosmic rays. This radioactive carbon is oxidized to carbon dioxide, which in turn is mixed throughout the atmosphere by air currents and utilized by plants along with nonradioactive carbon dioxide to form carbohydrates. The high solubility of carbon dioxide in water transfers a large portion of the Earth's radioactive carbon to the oceans. Radioactive carbon is distributed through all living material as a result of the dependence of animal life upon plant food.

### Death Stops Intake of Carbon-14

Death of a plant or an animal terminates the processes by which its tissue structure receives Carbon-14 from the environment. Since Carbon-14 is unstable and spontaneously converts to nitrogen, the remains of once living material will contain progressively smaller amounts of Carbon-14 with the passage of time. Laboratory measurements on known amounts of radioactive carbon have established, within an uncertainty of less than 100 years, that in 5,730 years, half of an initial amount of Carbon-14 will "disappear" as a result of radioactive decay into nitrogen. On the basis of this information, 5,730-year-old remains of plants and animals may be expected to contain half as much radioactive carbon as they did at death.

For convenience, data on the radioactive carbon content of a sample is reported by specifying a "radiocarbon age." The radiocarbon age describes the relative amount of radioactive carbon in the sample in terms of the relative amount of radioactive carbon in an oxalic acid standard supplied by the U. S. National Bureau of Standards. The NBS oxalic acid standard of Carbon-14 activity is adjusted to provide a reference based on the average Carbon-14 activity of wood which was growing in A.D. 1850.

The strength in which the NBS standardized oxalic acid is supplied is such that 95 per cent of its specific radiocarbon activity is equivalent to the specific radiocarbon activity to be expected from wood growing in A.D. 1950 under conditions that prevailed in A.D. 1850. The radiocarbon age of a sample is the number of years that would be required for the specific radiocarbon activity level defined by the NBS oxalic acid standard to decay to the specific activity level measured in the sample.

### Radiocarbon "Time" Is Relative

Radiocarbon ages are based on a 5,568-year half-life for Carbon-14 decay (the average of early less precise measurements), rather than on the more accurate value of 5,730 years in order to avoid confusion in comparing recent determinations with the large number of radiocarbon ages that appeared in the literature during the time when 5,568 years was the best available value for Carbon-14 half-life. Since the radiocarbon time scale is arbitrary and does not directly measure real time, there is no need for basing it on an absolutely accurate determination of half-life.

Those who are unhappy with the 5,568-year half-life convention can convert radiocarbon ages to a 5,730-year-based scale with a simple multiplication by 1.03. A sample with a specific radiocarbon activity equal to one-half 95 per cent of the specific radiocarbon activity of the NBS oxalic acid standard is assigned a radiocarbon age of 5,568. The radiocarbon date for the time when this sample ceased to exchange carbon with its environment would be 5,568 B. P., or 3618 B.C. (5,568-A.D. 1950).

In summary it may he said that radiocarbon ages are based on a 5,568-year half-life and are standardized against preindustrial-revolution conditions (A.D. 1850), and that A.D. 1950 is used for the zero point on the radiocarbon time scale. (Stuiver and Suess, Editorial Statements, *Radiocarbon*, Vol. 8, 1966; Half-Life Statement, *Proceedings of the Sixth International Conference on Radiocarbon and Tritium Dating.)*

Reasons for basing radiocarbon ages on conditions in A.D. 1850 are of interest. Since A.D. 1850, man has introduced into the Earth's atmosphere large amounts of carbon dioxide produced by the use of fossil fuels-coal, oil, and natural gas. These fossil fuels contain a negligible amount of Carbon-14 and are described as "infinite age" on the radiocarbon time scale. During the 100-year period between A.D. 1850 and A.D. 1950, use of fossil fuels released infinite age carbon equivalent to approximately 11 per cent of the total carbon presently contained in the atmosphere. Had this contribution of nonradioactive carbon been confined to the atmosphere it would have reduced the radiocarbon activity of the atmosphere by approximately 10 per cent.

The actual decrease experienced (Suess effect) was only one to three per cent and probably averaged a strong one per cent, indicating that a large portion of the carbon released to the atmosphere by man's use of fossil fuels has been absorbed in the ocean (95 per cent of the carbon in the Earth's carbon dioxide exchange system is contained in the ocean.)

Another factor related to human activity that influences the radiocarbon concentration in the atmosphere is the release of neutrons by atomic reactors and nuclear weapons.

By using as a "contemporary" reference the most recent radiocarbon activity level that has not been significantly affected by human activity, radiocarbon ages can more readily be used in studies of the past. The most accurate value for the "contemporary" activity level is considered to be 13.6 disintegrations per minute per gram of plant or animal carbon.

### Radiocarbon and Historical Ages

Measurements made in radiocarbon dating laboratories throughout the world do not determine dates or historical ages of samples. The laboratory procedures only determine the amount of radioactive carbon which a sample contains at present. The historical time lapse since a given specimen was a part of a living organism which exchanged carbon with its environment is an **interpretation** based in part on its radiocarbon age. The postulation of a date or age associated with the sample requires an *assumption* concerning the relative amount of radioactive carbon in the environment which supported the life of the organism from which the sample has been derived.

Major research effort is being directed toward developing reliable correlations between radiocarbon age and historical age. If the relative amount of radioactive carbon in the atmosphere had been at the A.D. 1850 level throughout the time life has existed on the Earth, radiocarbon ages, when adjusted to the 5,730-year half-life, would be identical with historical age. Tree-ring dating has established a precise and reliable chronology extending back to 59 B.C. By measuring the radiocarbon activity in precisely dated wood fiber, a chart can be prepared for converting radiocarbon age into historical age over the past 2,000 years. Such a chart shows fluctuations in the relative amount of Carbon-14 in the atmosphere during this period, but these fluctuations appear to have been limited within a range of less than five per cent of the A.D. 1850 level.

Because of the fluctuations in the atmosphere Carbon-14 activity and the difficulties in standardizing one radiocarbon laboratory against another, the minimum uncertainty in any radiocarbon age is commonly considered to be plus or minus 100 years (see *Radiocarbon*, Vol. 8, 1966, pp. 27, 213, 240, 340, and 453). Accordingly, if there are no contamination problems, the historical age of a sample which has a radiocarbon age no greater than about 2,000 years may confidently be considered to lie within a range of uncertainty equal to plus or minus twice the uncertainty specified for the radiocarbon age, providing this range is no less than plus or minus 200 years (see Radiocarbon, Vol. 8, p. 256).

Attempts to derive historical age from radiocarbon age yield increasingly uncertain conjectures for samples older than 2,000 years. Tree-ring chronology has been extended from 59 B.C. to approximately 2400 B.C. using the Bristlecone Pine. The growth characteristics of this tree make it unsatisfactory for the establishment of a precise long-term growth-ring sequence. Attempts to correlate Bristlecone Pine growth-rings with radiocarbon ages indicate that either ring counting has over-estimated the age of the oldest Bristlecone Pine material by 500 to 1,000 years, or the relative amount of Carbon-14 in the atmosphere around 2,000 B.C. was in the order of 10 percent greater than in A.D. 1850.

### Radiocarbon Dating and Genesis

Aside from the information supplied in the book of Genesis, there is at present no firm basis for inferring historical age for any sample with a radiocarbon age greater than 3,500 to 4,000.

Those who accept the Genesis account as inspired and historically valid interpret the radioactive age for ancient material, such as Tertiary oyster shells, anthracite coal, mineral oil, natural gas, et cetera, to indicate that the atmosphere of the Earth before the Genesis flood had a relative Carbon-14 activity no greater than 1/100, and possibly less than 1/1000 of the level that became established by 1,500 B.C. (A relative Carbon-14 activity of 1/128 the contemporary level corresponds to decay over seven half-lives, or a radiocarbon age of 39,976. $2^7 = 128$; 7 X 5,568 = 39,976. )

Although up to the present no basis has been found for precise and reliable conversion between historical age and radiocarbon ages greater than 3,500, radiocarbon age determinations in the 4,000 to 30,000 range do, nevertheless, give important support to the book of Genesis. With a particularly appropriate figure of speech, radiocarbon dating has been described by a leading archaeologist as having an effect on previously-held archaeological viewpoints equivalent to the devastation produced by an atom bomb.

Radiocarbon dating of spruce trees buried by glacial advance in Wisconsin has forced geologists to **reduce** the presumed time which has elapsed since major glacial advance from 25,000 solar years to 11,400 radiocarbon years. Assuming a one-to-one correspondence between radiocarbon years and solar years results in a drastic compression of the time which previously had been considered available for the development of Western civilization.

Remarkable scarcity of objects which are clearly associated with human activity, and which have radiocarbon ages in excess of 12,000, suggests that the human population has grown from a small beginning in a short period of time. It is highly significant that the greatest radiocarbon ages firmly related to human activity are provided by material from the Middle East, the Ukraine, and the Mediterranean basin.

Radiocarbon ages for the oldest evidences of man indicate that the Earth was populated as a result of migration which spread out in all directions from the Middle East area, reaching the Western hemisphere by way of Alaska. Radiocarbon dating has established that the recent glacial periods in Northern Europe and Northern North America were coincident, that the earliest appearance of man in North America coincided closely with the latest advance of glacial ice across Wisconsin, and that both North America

and Northern Europe were settled rapidly after the first appearance of man in these regions.

### Radiocarbon Age and Farming

By the time corresponding to a radiocarbon age of 7,200, farming had been established throughout a strip of approximately 10 degrees latitude in width extending from Greece across southern Asia Minor to Iran. During the succeeding period of time represented by a span of 1200 "years" on the radiocarbon time scale, farming extended over the Nile delta, Northern Egypt, Babylonia, and Central Europe.

By the time corresponding to a radiocarbon age of 5,000, farming had become established in Northwestern Europe, Northwestern Africa. and the Ukraine. Data are lacking concerning the spread of agriculture eastward from Babylonia, but there are remains in India from the highly developed Harappa culture which have radiocarbon ages as great as approximately 4,300. This culture developed elaborate irrigation facilities and had a written language which appears to be unrelated to the writing of subsequent Asian cultures and which modern man has been unable to decipher.

The limited time suggested by radiocarbon dating for the spread of human population over the Earth, and for the development of ancient civilization, has led many individuals whose world view is *not* based on the information given in the Bible to seek support for the postulate that in the ancient past the Earth's atmosphere contained a *greater* relative amount of Carbon-14 than it has over the 3,000 year period up to A.D. 1850. (Every doubling of the initial relative amount of Carbon-14 in a specimen over the relative amount which characterizes material living in A.D. 1850 would add 5,730 solar years to the difference between the historical age and the radiocarbon age of the specimen, if the historical age is greater than a radiocarbon age based on assumed initial conditions equivalent to those which existed in A.D. 1850.) Search for firm evidence to support a higher Carbon-14 level in the ancient atmosphere has not been fruitful.

Since primary cosmic ray particles are deflected away from the Earth by its magnetic field the role of this field in the Carbon-14 production rate has been investigated. Detailed calculation indicates that a complete disappearance of the Earth's magnetic field would no more than double the present Carbon-14 production rate, with consequent extension of the time indicated by the oldest radiocarbon dates by no more than 6,000 years.

A higher level of Carbon-14 activity would be brought about by an increase in the primary cosmic ray activity. Since studies of the cosmic ray effects in meteorites indicate that the cosmic ray flux in the solar system has remained close to its present level over a period of time many orders of magnitude greater than that with which radiocarbon dating is concerned, the only possibility for a large increase in the relative amount of Carbon-14 appears to be through a reduction in the amount of nonradioactive carbon in the atmosphere.

An addition of 17,190 solar years to the historical age of ancient material in this manner would require a reduction of the atmospheric carbon dioxide to one-eighth its present concentration ( 17,190 = 3 x 5,730; ½ x ½ x ½ = $^{1}/_{8}$). Since only 0.053 percent by weight of the Earth's atmosphere is carbon dioxide at present, and since the fossil record indicates much more extensive and more luxurious vegetation than now covers the earth, a significant reduction of atmospheric carbon dioxide below the present level does not appear to be a reasonable postulate.

It seems much more suitable to think of the Earth's ancient atmosphere as characterized by a higher, rather than a below-modern, carbon dioxide composition. Coal, oil, and gas reserves, limestone beds, shales, and vast amounts of organic materials scattered in gravel beds throughout the planet indicate that before the Flood the biosphere was many times richer in carbon than it is today. A plant or animal that might have lived at a time when the biosphere contained the same amount of Carbon-14 but eight times the amount of nonradioactive carbon as are characteristic of contemporary conditions would at its death have a radiocarbon age of 17,190 "years" in comparison with contemporary materials.

We have already noted that the testimony of radiocarbon dating and the testimony of the book of Genesis taken together support the view that prior to the Flood the relative amount of radioactive carbon in the atmosphere and in living things was at most 1/100 or possibly less 1/1000 of its present value. The reader must be cautioned that harmony between the historical requirements of the book of Genesis and radiocarbon ages cannot be obtained by postulating a hundred-fold greater concentration of carbon dioxide in the pre-Flood atmosphere, since carbon dioxide becomes highly toxic when it reaches unit per cent levels. It is the amount of carbon in the entire carbon dioxide exchange system, not the relatively small amount contained in the atmosphere, that determines the Carbon-14/ Carbon-12 ratio with which we are concerned.

While there are at present no scientific data to indicate that any of the following changes have taken place, it is worth noting that each one is within the range of possibility and would increase the relative amount of radioactive carbon in the atmosphere over its pre-Flood level:

(1) reduction of the Earth's magnetic field from a pre-Flood intensity which kept most of the primary cosmic ray particles from interacting with the atmosphere;

(2) loss of an outer region of water vapor which absorbed primary cosmic rays and cosmic-

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# RADIOLOGICAL DATING AND SOME PERTINENT APPLICATIONS OF HISTORICAL INTEREST

## DO RADIOLOGICAL "CLOCKS" NEED REPAIR?

MELVIN A. COOK*

*Radiocarbon dating is bused on the incorrect assumption that C-14 is in equilibrium, the rate of formation equaling the rate of decay. But recent data show rate of formation is 18.4 and rate of decay 13.3 so that a non-equilibrium condition exists. This situation telescopes all radiocarbon ages to about 10,000 years or less. Consideration of uraniun-thorium-lead age determinations show at least six basic difficulties involved in determining true age. Most serious is evidence for artificial aging by the so-called "neutron-gamma" reactions. A number of crucial examples are given. Thus the uranium ore at Shinkolobwe, Katanga contains no thorium or common lead, but .08% Pb-208! If it came from "neutron-gamma" reactions, the likely explanation of this ore, it is a modern ore, far younger than the assigned 640 million year old age of conventional dating!*

*Potassium-argon dating does not take into account the relatively great amount of argon-40, branching ratio data, and uncertain half-life of some isotopes. Pure guess work is required to* ***establish the actual concentrations of the isotopes*** *involved in the rubidium-strontium "time clock" at the beginning of a particular mineral.*

*An extensive (discussion of radiocarbon dating in relation to a global sea level cycle is given. Also dates of various civilizations based on an equilibrium radiocarbon model are shown to be seriously older than reality.*

In a recent book, *Prehistory and Earth Models,* [1] (abbreviated in this article: PEM) the prominent radioactive "time clocks" were examined including radiocarbon, the six uranium-thorium-lead methods, and the potassium-argon and rubidium-thorium rock dating methods.

The conclusions are summarized below, along with more, recent findings and interesting applications of radiocarbon dating. They may be further summarized by the simple statement that there are really no reliable long-time radiological "clocks," and even the short-time radiocarbon "clock" is in serious need of repair.

### The Foundations of Radiocarbon Dating

The radiocarbon (or C-14) method of dating biospheric (dead) specimens, and other carbon-containing substances that have lost contact with the carbon cycle at some point in time, is based on the incorrect assumption that C-14 is in steady state (or in equilibrium) in the earth as a whole—in the sense that its overall rate of formation is equal to its rate of decay. Direct, reconfirmed observations show that the rate of decay is only about two-thirds as great as the rate of formation, and therefore that C-14 must still be building up in the carbon cycle of the earth.

In analyzing this equilibrium postulate, Libby, the author of the radiocarbon method, himself found evidence for this unbalance, However, he *discounted* the evidence in favor of what he took to be more compelling, albeit hearsay, evidence that the earth is too old for C-14 to be out of balance, because it would, in all practical considerations, come into balance from any conceivable unbalance within about 30,000 years.[2] Libby found the rate of decay $R_d$ to be 15.3 counts per gram per minute for carbon from the living biosphere, and the rate of formation $R_f$ (normalized to the same units) to be 18.8 giving for the ratio $R = R_d / R_f$ the value 0.81.

More recent studies of Hess, *et. al.*[3] on the neutron source strength raised $R_f$ to 21.2. Lingenfelter[4] then recalculated $R_f$ and lowered it to 18.4 ± 4.3. Suess[5] later lowered $R_d$ to 13.3 on the basis of much more extensive data on the decay rate, and gave a more careful analysis of the carbon inventory in the carbon cycle taking into account the ocean circulation lag.

Thus, basing our claim for an unbalance of radiocarbon in this cycle on the most recent findings of Lingenfelter and Suess, the value now assigned to R is 13.3/18.4 = 0.72. Recognizing this evidence for an unbalance, Lingenfelter himself attempted an explanation based on fluctuations, thus carefully avoiding the short age-of-the-atmosphere implication of this non-equilibrium condition—no doubt realizing the difficulties the present writer encountered in attempting to point out this nonequilibrium condition, and its dating implications six years earlier.[6]

It is, of course, natural that creationists would adopt the seemingly obvious nonequilibrium model, and use it to date the atmosphere itself, whereas conventional science would seek to hide this drastic implication of the unbalance of C-14 in the earth's atmosphere.

*Melvin A. Cook is Professor of Metallurgy at the University of Utah, and President of IRECO Chemicals, Salt Lake City, Utah. He earned his Ph.D. from Yale University.

**Unbalance of Radiocarbon**

The suggestion that radiocarbon is still increasing in the earth and that it is appreciably below an equilibrium value, where R = 1.0, was given additional support in a recent symposium participated in by Libby and Suess and reported by Switzer.[7] The latter remarked that "these results (referring to calibrations via tree rings and sedimentation rates) confirm a *change* in carbon-14 concentration (in the atmosphere) that occurred 2500 years ago and *indicate* that the *concentration increases* at least during the past 10,000 years" (Parentheses and emphasis added).

With such reappearing support for an unbalance of radiocarbon in the atmosphere it would appear the only scientific thing to do to discard the equilibrium model in which R = 1.0 and go instead, with the evidence that R is only about two-thirds this great, either to a nonequilibrium model based on the actual value of R observed, or else discard the radiocarbon model of a short time clock altogether. In the nonequilibrium model one has no more difficulty in dating a sample than in the equilibrium model as far as tractability is concerned. Moreover, it would seem to be the only model that can really avoid the necessity of having to discard the radiocarbon method of dating in the face of the compelling and recurrent evidence for an unbalance in C-14 in the carbon cycle–the atmosphere, hydrosphere and biosphere.

Particularly interesting is the fact that the nonequilibrium model brings the results of radiocarbon dating much closer to Bible chronology in "historical" comparisons which is why scientists avoid it so tenaciously. Indeed, the value R = 0.72 **telescopes** all results by this method to about 10,000 years or less! This may be seen only by going through the mathematics of the radiocarbon theory, and it is, therefore, presented below in its most elemental form for the benefit of non-mathematicians. Figure 1 illustrates quantitatively the application of the nonequilibrium model by showing (1) build-up of radiocarbon in the earth as a whole, and (2) the nature of the discrepancy between the equilibrium and the nonequilibrium model as regards radiocarbon dating of biosphere specimens.

When radiocarbon is out of balance in the earth, as it is at present, its concentration C builds up in accord with the equation $R = R_f - R_d$ given by the differential equation of rudimentary calculus: $dC/dt = k_f - k_dC$, in which $k_f$ expresses the constant rate of formation and $k_dC$ expresses the (first-order) rate of decay which, like any radioactive substance, is proportional to the C-14 concentration C.

If the C-14 were in equilibrium, dC/dt would be zero, so that $k_f = k_dC_m$ where $C_m$ is the maximum or steady state concentration, a value 1/0.72 greater than the present value according to the above evidence. The constant $k_d$ is related to the half-life T by the equation $k_d = 0.693/T$. The observed half-life of C-14 is 5760 years giving for $k_d$ the value $1.2 \cdot 10^{-4}$ years$^{-1}$. Thus, introducing the ratio $x = C/C_m$ in place of C by dividing through the differential equation of the C-14 balance by $C_m$, we obtain the equation in the simple form

$$dx/dt = 1.2 \cdot 10^{-4}(1-x)$$

(Editors note: Half-life of carbon is an estimate, and 5568 years has been preferred. A more precise value from the mass spectrometer gas counting method is 5760 years.)

We wish to obtain from this differential equation the time interval $t_p$ from the beginning of the carbon cycle to the present. This cannot actually be done without knowing the ratio $C/C_m$ or x at the "beginning" which, of course. we do not know. However we can compute an *upper limit* for this time by assuming that $x = x_b = 0$ at the beginning. The above equation may then be integrated between the limits ($x_b = 0$, $t_b = 0$) and ($x_p = 0.72$, $t_p$) with the result:

$$-\log_e(1 - x_p)/(1 - x_b) = 1.2 \cdot 10^{-4} t_p \text{ or,}$$

$$t_p = -\log_e(1 - 0.72)/1.2 \cdot 10^{-4} = 10^4 \text{ years}$$

Note also that, if $x_b$ were any finite value less, of course, than $x_p$ the time $t_p$, computed by this equation would be less than 10,000 years. However, if we take the extremes of uncertainty given by Lingenfelter for $R_t$, we would have $x_b$, between 0.59 and 0.94. Then the upper limit for $t_p$ (taking again $x_b = 0$) would be somewhere in the range between 7500 and 23,000 years.

**The Foundations of Dating by Radiological "Long-time" Clocks**

**Uranium-Thorium-Lead** (U - Th - Pb) "time clocks" are six in number: the "Lead-Alpha" method, the U-238/Pb-206, U-235/Pb-207, Th-232/Pb-208 methods, the "common lead" method, and the "Lead-Ratio" method. Difficulties in these methods are summarized below with particular emphasis placed on the (circumstantial) evidence for artificial aging by the so-called "neutron-gamma" or (n, γ) reactions.

1. "Time clock" readings from which the oft-quoted 4.51 billion years for the age of the earth have been obtained are inconsistent with observed atom and isotope abundance data understood (at least for atoms without radioactivity or radioactive sources) by the familiar "even-odd" and "magic number" rules. That is, an isotope with mass number A, atomic number Z, and neutron number N all even is expected to occur in greater natural abundance than one with one or more of these numbers odd. Lead-

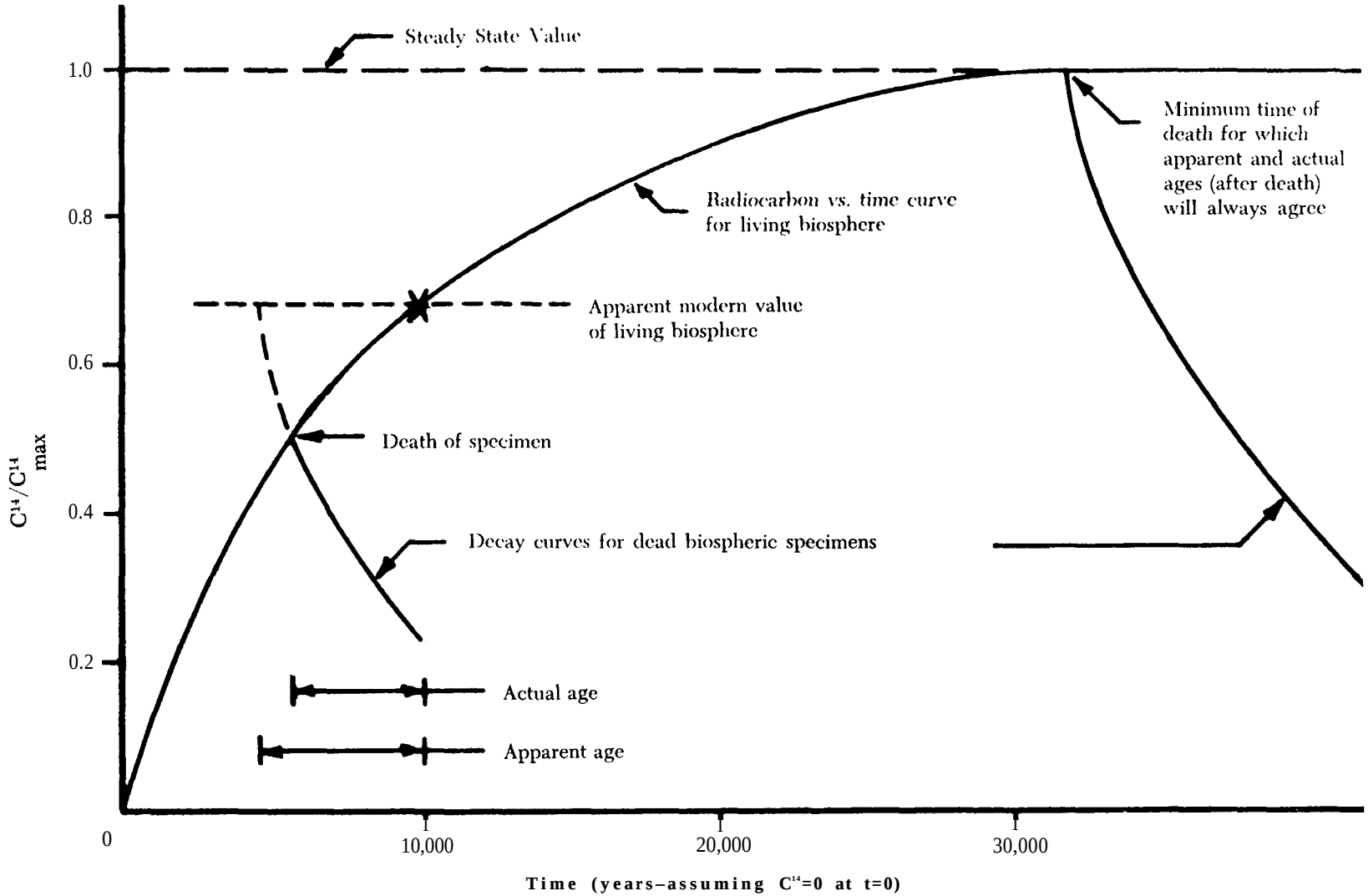


**Figure 1. Radiocarbon in Biosphere-Living and Dead. This figure illustrates quantitatively the application of the non-equilibrium model by showing (1) buildup of radiocarbon in the earth as a whole, and (2) the nature of the discrepancy between the equilibrium and the non-equilibrium model as regards radiocarbon dating of biospheric specimens.**

206 is an even-even-even isotope, whereas Pb-207 is odd-even-odd.

The observed "modern" relative abundance Pb-206/Pb-207 is about 1.2 which is normal considering the proximity of these isotopes to the magic number 126 (Pb-208, an even, even, even isotope has 126 nucleons all alike, other magic numbers being 2, 8, 20, 50, and 82). However, if the earth were really 4.5 billion years old, the ratio Pb-206/Pb-207 at the beginning would have been only 0.45, a value which would seemingly violate these natural abundance rules. While interesting, this is, of course, not a crucial argument against the conventional claim for great antiquity.

2. Differences in isotope concentrations applied in reading these time clocks are often much less than isotope variations from one mineral to another in the nonradioactive elements with no radioactive sources—of which twelve having atomic weights less than that of zinc, were found to show average variations of 6.6%. This is a value which would mean a billion years or so discrepancy in the long time clocks of geochronometry, i.e., those of the U-Th-Pb, potassium-40/argon-40 and rubidium-87/strontium-87 systems.

3. A statistical analysis of the extensive available data for common leads[8] from identical geological formations made by applying the conventional theory of radiological dating revealed that common leads really have in them *no time index* that can be sorted out and differentiated from observed random variations like those needed to account for variations from one sample to another in nonradioactive and nonradiogenic elements. This was very surprising to one led to think that the common leads could be accurately dated by the lead ratio method.

Lead-204, incidently, is used as the index in dating common leads because it has no radioactive source. The assumption is made that the ratios Pb-204/Pb-206/Pb-207/Pb-208 are 1.0/18.5/15.7/38.0, or thereabouts, in common leads that have never been contaminated with radiogenic lead from U-Th decay. Any difference from this or some other set of lead-isotope assumed to represent uncontaminated lead is supposed to represent the radioactive decay contribution to the common lead before mineralization in the present occurrence. From this one computes the time before mineralization by the lead ratios.

4. The most serious difficulty is the impossibility of defining initial conditions and isotope concentrations needed in all calculations of time with the radioactive time clocks. One can really never know these necessary concentrations so that the science of radiological dating has become merely a *science of guessing.* The best guess is supposed to be that based on lead isotope ratios, all other methods such as the helium and the lead-alpha methods having thus fallen into disrepute.

5. There are interesting and revealing systematic differences in the four most important clocks of the U-Th-Pb system employing these ratios. Let us take $t_1$, $t_2$, $t_3$, and $t_4$ as the times found from the lead ratio method Pb-206/Pb-207, the U-235/Pb-207, the U-238/Pb-206 and the Th/Pb-208 methods, respectively.

The interesting situation is that the ratios $t_1/t_2/t_3/t_4$ average 1.35/1.18/1.12/1.0! Why this systematic difference between these closely related time clock? The answer when completely appreciated may well prove to be fatal to the U-Th-Pb time clocks. It is definitely not due to diffusion, radon leakage or any of the usual explanations. Chemical and physical analyses are not at fault either; analytical methods are next to perfect in the U-Th-Pb system.

While it cannot affect $t_1/t_2/t_3$, uranium accretion via micrometeorites could easily upset dating by this method, because accretion products are concentrated at the surface where scientists take their samples rather than uniformly throughout the rocks of the crust. A slight surface contaminant of this nature could well be serious when differentiation is considered.

Leaching of uranium from rocks and runoff in river waters into the oceans, actually at rates comparable to the overall decay in the entire crust, can also cause serious discrepancies. While almost as much uranium is disappearing in this way from the surface sediments as is decaying in the entire crust of the earth, particularly revealing is the dilemma that the oceans have in them only a few thousand years of such uranium accumulation. How old are the oceans after all?

6. As mentioned, the *most significant* consideration in explaining the systematic discrepancies in the U-Th-Pb time clocks, which if correct, would obviously all tell the same time, pertains to the neutron-gamma or (n, $\gamma$) reactions. That they are very important seems (circumstantially) obvious when one considers the fact discussed at length elsewhere that the nitrogen-14/nitrogen-15 ratio is only about 65% as great in nitrogen found in compounds like nitrates occurring in radioactive minerals as in the atmosphere.

The $N^{14}$ (n, $\gamma$) $N^{15}$ reaction is seemingly the obvious answer, and one that has been given by others for this observation. But if radiation in a radioactive deposit can knock down the N-14/N-15 ratio this much, surely the (n, $\gamma$) reactions must also be important in the U-Th-Pb system!

Reasons have been given[10], furthermore, that fast neutron "pile" factors should be involved in

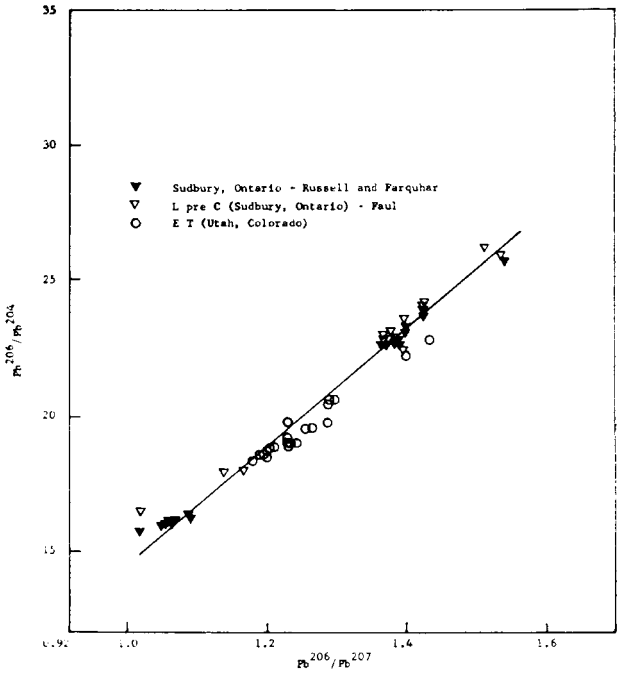


**Figure 2. Does the Lead-Ratio method really work? This figure illustrates that common leads may not provide a reliable time clock. Note, for example, that the "preferred" lead ratio method fails to distinguish between Pre-Cambrian (assigned ages of greater than 500 million years) and Early Tertiary (assigned an age of less than 60 million years). (L pre C = Pre-Cambrian, E.T. = Early Tertiary**

large U-Th ore bodies. While fast neutron concentrations are no doubt small compared with those possible in man-made fast neutron piles, they need to be only around a millionth as great to upset completely the U-Th-Pb time clocks! Not only would fast neutrons (and slow neutrons also) tend to speed up the apparent decay rates of the radioactive species, but would also convert some Pb-206 to Pb-207 and some Pb-207 to Pb-208. Both of these types of reactions would tend to "age" unrealistically the U-Th-Pb minerals depending on the relative importance of radioactive decay and the (n, γ) reactions.

There are a number of apparently crucial examples where it would appear that the (n, γ) reactions far outweigh the conventional U-decay and Th-decay reactions. Furthermore, the situation appears to be very general! These include cases where both Pb-204 and Th are absent or negligible, but where Pb-208 is present. By approximately quantitative age corrections based on the observed Pb-208 concentrations, and the assumption that they came from the (n, γ) reactions, it appears that one *effectively wipes out all of geologic time.* The following are two striking examples:

(a) The uranium ore at Shinkolobwe, Katanga, contains no Pb-204 (thus no common lead) and no Th-232, but it contains 0.08% Pb-208. The observed ratio Pb-206/Pb-207 is 94.2/5.72 = 16.5 from which the ore has been assigned the age 640 million years. The questions are: where did the Pb-208 come from, and what does it mean concerning age?

If we assume that it came from the $Pb^{207}$ (n, γ) $Pb^{208}$ reaction and that Pb-207 was also reinforced by the $Pb^{206}$ (n, γ) $Pb^{207}$ reaction (the correction†, based also on the assumption that the neutron cross-sections of the leads are all about the same), we arrive at the striking result that this ore is really "modern"! That is, the ratio x = Pb-206/Pb-207 is 21.7 for the leads currently being generated by U-decay. But the correction in x in this case is given by x = (94.2 + 1.3)/(5.72 – 1.3 + 0.08) based on the actual composition of the leads and the assumption that the 0.08% Pb-208 came from Pb-207. Thus instead of the value 16.5, the ratio x would have been 21.2 without the (n, γ) reactions.

(b) The uranium ore at Martin Lake, Canada, also contains no Pb-204 and only 0.02% as much Th as U. But it has in it an average of 0.53% Pb-208. The x-ratio in this case is 90.4/9.1 = 9.93 and the ore has accordingly been assigned an age of 1640 million years. But what about the lead-208?

The (n, γ) correction† in this example is given by the ratio x = (90.4+ 5.2) (9.1 + 0.52 – 5.2) = 21.7. Strange, is it not, that this would agree precisely with the ratio of leads being generated today by U? This is, of course, somewhat fortuitous because the leads do not have precisely the same neutron cross-section, and there are some variations in the dozens or so samples of the ore from which the average values here used were obtained.

The important point is that the (n, γ) mechanism of the systematic discrepancies not only explains these discrepancies but, at the same time, erases all readable ages read from the "long-time clocks". Figure 2 illustrates that common leads may not provide a reliable time clock. Note, for example, that the "preferred" lead ratio method fails to distinguish between Pre-

†To correct the x (= Pb-206/Pb-207) ratio for the influence of (n, γ) reactions so it will be useful in the lead-ratio radioactive time clock in cases where Th and Pb-204 are both negligible as in the Shinkolobwe and Martin Lake examples, the Pb-208 must be accounted as Pb-207 since it came from the reaction Pb-207 (n, γ) Pb-208. Likewise, at equal cross sections for Pb-206 and Pb-207 an amount of Pb-207 equal to x • Pb-208 must be accounted as Pb-206 since it came from the Pb-206 (n, γ) Pb-207 reaction. Therefore, the corrected x-ratio is:

$$x\ (\text{corrected}) = \frac{\text{Pb-206} + x \cdot \text{Pb-208}}{\text{Pb-207} - x \cdot \text{Pb-208} + \text{Pb-208}}$$

This is the basis for the data given in these two examples.

Cambrian (assigned ages of greater than 500 million years) and Early Tertiary (assigned an age of less than 60 million years)! (Pre-Cambrian = L pre C, Early Tertiary = E.T.)

**The Potassium Argon** or K-40/A-40 method of radioactive dating may likewise be seriously questioned at least for the following significant reasons:

(1) There is altogether too much argon-40 in the earth for an appreciable part of it to have been generated by potassium-40 decay even if one grants for the sake of argument that the earth is several billion years old.

(2) The K-40/A-40 method is based on uncertain half life and branching ratio data (Ca-40 about 88% to 92% and A-40 about 8 to 12% of K-40 decay.) Even by tacitly assuming the minimum branching ratio of 0.08 this method gives "ages" averaging greater than those of the lead ratio method which in turn yields the oldest ages read from the U-Th-Pb "time clocks. "

(3) Like the situation in the U-Th-Pb system, physical chemical analyses of (present) concentrations of the necessary elements and isotopes of the K-40 "clock" are excellent, but sampling is irreproducible and initial concentrations (also quite necessary in applying dating formulae) can be known only by guesswork, however scientific. For instance, what is the justification for applying highly precise analytical methods in an environment where contamination (by precisely the same isotope being analyzed) is greater by a factor of more than a hundred than the radioactivity-generated product one wants to determine?

**The Rubidium-Strontium,** or Rb-87/Sr-87 "time clock" is another one where pure guesswork is required to *establish* the actual concentrations of the isotopes of this "time clock" at the beginning of a particular mineral.

Sr-87 occurs in the crust at an abundance at least ten times greater than could be generated from the available rubidium-87 in five billion years.

On the other hand, Rb-87 occurs in the same rocks at 50 ppm and with a half-life of 60 billion years. Therefore, even if one were to agree for the sake of argument that the earth is five billion years old, radiogenic Sr-87 would be only about 5% of all Sr-87 present in the rocks.

Again how can one possibly use this method under such an overall contamination? An indirect answer in this case may have been found already in the empiricism that has developed out of extended efforts to apply the method, i.e., in trying to devise scientific guesses for the necessary initial concentrations of Rb-87 and Sr-87.

The ratio Sr-87/Sr-86 ranges between 0.7 and 0.9 in all samples, "old" or "young", but the value needed for internal consistency with other dating methods turns out to be 0.708 ± 0.001. This was the guess decided upon by some authorities to arrive at how much Sr-87 was present in a particular mineral at its beginning.

This guess eventually became popular in dating rocks by this method; it circumvented more difficult procedures designed to answer the really unanswerable question regarding the isotope concentrations at the beginning of a mineral that one needs to know in order to apply any radioactive time clocks. On the other hand, it was shown that unless all rocks are really the same age within about 45 million years, this guess would be inconsistent with observed total abundance data, i.e., it would require exceptions to the rule to be as prominent as the rule.

### Radiocarbon Dating of a Global Sea Level Cycle

Uplifts in Canada and Fennoscandia following (the sudden) loss (from the continent into the sea) of the Wisconsin ice caps were correlated. and evidence for this catastrophic disappearance of the ice caps has been presented in the ice cap model of continental drift as outlined in PEM. Eardley[11] noticed in 1964 the global sea level changes predicted three years earlier[12] by the ice cap model; however, he considered them to be caused not by ice caps, but by a slowing of the rate of rotation of the earth over the past 100 million years.

It was pointed out in PEM (pp 138-9) and by Flatte[13] that this would be impossible simply because the relaxation of an unbalance in the crust of the earth is much too rapid (only about 4000 years for a 60% adjustment). In other words, the oceans and continents would adjust at precisely the same rate to a uniform slowing of only about two percent in 100 billion years. Hence no differential shoreline changes would occur by this mechanism.

Eardley regarded the shoreline data described in the U.S. Navy Hydrographic Charts studied by him to be independent of the ice cap effects on the basis that the maps used by Gutenberg[14] and others (from which they concluded that "sea level has risen around the world in amounts ranging from 10 to 20 cm in the past century") showed no latitude effects. However, ice sheet build up and decay occurring over a period of only a few thousand years would simply have to produce latitude effects in land mass adjustments of the character described by him.

There is little doubt that polar land masses were depressed (roughly the amounts noticed by Eardley) by the Wisconsin ice caps. These depressions were under a total load corresponding to about 20 million square miles of ice several miles deep on the two poles. This not only depressed the original continent in polar regions, but also elevated the crust in equatorial and low

latitude regions as required by mass (or volume) conservation. Following sudden loss of this ice into the seas, the land mass adjustments reversed themselves causing a rise at the poles and submergence at low latitudes.

Shoreline regressions in Canada were studied by Farrand and Gajda[15]. Two recent "back to back" publications by Emery and Garrison[16] and Redfield[17] describe the corresponding (reverse) situation for the seashores in low latitudes along the Atlantic, Gulf and Pacific Coasts. In addition an article by Emery *et al.*[18] described the nature of samples used in radiocarbon dating of these conditions. Taken together these studies of (radiocarbon-dated) uplifts and submergences confirm the type of global shoreline reactions predicted in the ice cap model.

**Shoreline Predictions Confirmed**

They show first (by their coincidence in time) that the high and low latitude shoreline adjustments are really part of the same global adjustment to an isostatic unbalance over the whole crust.

Second, they show that the adjustment cycle changed from equator to pole as predicted by a model in which the crust was suddenly thrown out of balance by unloading at previously heavily loaded poles.

Third, they show the required exponential decay in time of this unbalance and the fact that there remains even yet an appreciable unbalance. The latter point is especially significant when one also realizes that any such unbalance would be more than 75 percent adjusted in 20,000 years and only about two-thirds of it has adjusted so far.

As for Canada a remarkable plot of "isobases of the marine limit" by Farrand and Gajda[19] shows that the shorelines once extended to the very apex of the North American continent. This means that the farthest advance of the shorelines corresponded to the arc with a center in the islands off Northwest Greenland, passing through the southwest edges of the Great Lakes, i.e., the region which divides the flow of water from south and southwestward (into the Mississippi, Ohio, Missouri Rivers), and northeastward into Hudson Bay and The St. Lawrence River.

These shorelines have since receded in high (northern) latitudes quite regularly and over thousands of miles to their present positions. The greatest advance of the shorelines over the continent was described by a semi-circle called by Farrand and Gajda the "limit of warping-Whittlesey zero" which not only passes through the southwest Great Lakes region but also the Northwest Territories and part of New England. The high latitude shoreline regression is associated with uplifting land masses amounting to more than 1500 feet in some places.

While these uplifts were going on in Northeastern Canada, data presented by Emery and Garrison[20], and by Redfield[21] (also based on conventional - equilibrium - radiocarbon dating) reveal just the reverse situation at low latitudes. Emery and Garrison, in fact, recognized the connection between the high latitude and low latitude vertical landmass adjustments.

Like the uplifts in Canada, those at low latitudes are still in progress at ever-decreasing rates. For example, the down-warping is now at a rate of about 0.025 inches per year in Long Island. They both began at much faster rates, but are slowing in the rate of adjustment as the unbalance gradually disappears showing again the effects of the catastrophic, sudden denudation at the beginning of the adjustment cycle.

**Global Extent of Adjustments**

The global extent of these land mass adjustments is shown by the fact that the same conditions were found in Argentina, Nigeria, Mexico and California as those found along the Atlantic coast of the U.S.A. Also significant are the facts that the rates and total depths of adjustment were smallest at lowest latitudes, increased northward to a maximum, decreased still northward and changed sign at the "Whittlesey zero", growing to large opposite magnitudes on northward.

A discrepancy of a few thousand years seems to exist for the time of beginning of the adjustment. That is, the data of Emery and Garrison seem to show evidence for an artificial aging associated with the fact that their curves extrapolate (without the help of very young specimens taken from near present shorelines) to finite ages at zero depth. This may be the result of (C-12 and C-14) ion exchange which may have unrealistically aged specimens used in the analysis associated with exposure to initial highly saline conditions (See p. 4 of PEM).

A striking fact noted in the data is that the dates of samples taken at the very edge of the Atlantic shelf are not greatly different, if at all, from those at the beginning of the uplifts in Canada. This correlation also supports the theory that these dates are also those to be assigned to the Atlantic rift itself and to continental drift. Appropriate allowances of course, should be made for the unbalance of radiocarbon and the possible unrealistic aging by ion exchange.

When the ice sheets of the Wisconsin were building up (according to the ice cap model of continental drift) the primordial continent ("Pangaea") at high latitudes (both north and south) was subsiding regularly under the ever-increasing polar ice loads. The total load eventually exceeded the strength of the continent and suddenly ruptured it from pole to pole. Im-

mediately after this catastrophic continental rupture, the shorelines were in the positions, approximately, described by Eardley, corresponding to maximum unbalance.

Since then they have readjusted at a maximum rate at first, but at ever-decreasing rates as the global isostatic anomaly lessened exponentially. This situation may be observed in all (radiocarbon-calibrated) depth vs. time results for these readjustments. The proximity in time of continental drift thus seems to be shown by the time scale placed on the related shoreline adjustments accompanying this catastrophic event.

**Radiocarbon and Biblical Dates**

But, in fact all of this occurred only about 4500 years ago (after the Flood in the "days of Peleg"), not even 10,000 to 15,000 years ago, much less, the 100 million years ago suggested by the slowing rotation model. After all, it is a matter of Bible history, is it not? (See Gen. 10:25 understanding "earth" as used there to refer to the usage in Gen. 1:10. Genesis 10:25 surely cannot refer to Genesis 10:32 as many have supposed. )

While radiocarbon may (when the facts become thoroughly appreciated) be forcing scientists ever closer to the Biblical account, one may still be disturbed by the fact that even the non-equilibrium model of radiocarbon does not bring the scientific and Biblical "records" into coincidence. Instead there remains even in the non-equilibrium model a discrepancy of 50% or more. This may be due to ion exchange, according to the following explanation:

(a) The Noachian Deluge should have raised the pH of the oceans appreciably when the hot, ultrabasic, emulsified materials of the upper mantle were churned into the waters flowing into the great rift.

(b) The dolomites found abundantly at and toward the bottom of the sediments seem to require basic, high temperature deposition based on what has been learned about conditions for their deposition.

(c) In this regard an increase of pH of only two units ( from 7.0 to 9.0) would be all that would be needed to account for the solution of all the "precipitates" at once in the waters of the Flood.

(d) In this connection Libby gave for the volubility of carbon (in the form of $HCO_3^-$ and $CO_3^{-2}$) in contact with the limestones, dolomites, etc., the value $S = A(1 — 0.74)$ showing that carbon would become soluble in proportion to (OH-). Subsequent neutralization of the basic solution by cooling and settling of the basic emulsion would then reprecipitate the carbonates rapidly and in a manner that would have trapped debris rich in fossils in the frozen carbonate rocks.

(e) Particularly interesting in this regard were the observations[22] that mollusks living in warm, basic waters high in carbonates had sufficiently reduced radiocarbon content to make them appear as though they had been dead 1000 to 2300 years! A similar condition may he noted for "Danger Cave" on the west banks of Great Salt Lake. This cave could not have been occupied as long as the 10,000 to 15,000 years ago indicated by the radiocarbon dating of artifacts found in it because it was most likely under the waters of Lake Bonneville until only 1500 to no more than 2000 years ago!

(f) Other radiocarbon dates of samples taken from the highly saline environment around the Great Salt Lake likewise show unrealistic radiocarbon aging caused by C-12 and C-14 exchange.

**Radiocarbon Dating of Ancient Civilizations**

Two quotations typify the situation quite well.

> Between five and six thousand years ago, in a few favored areas of the world, man firmly mastered the formulas that released him from an immeasurably long past of savagery, barbarism, and nomadism. . . For the first time in his history on earth he became aware of his humanity. He became civilized.[23]

> Perhaps the most important turning point in human history occurred thousands of years before anyone could record it. This was the point in time when, after two million years of vagabond hunting, man settled in villages and began domesticating animals and cultivating crops. Within a short one thousand years or so, the seed of civilization was planted, setting off a vastly accelerated pace of cultural and technological development that enabled man to progress from mud huts to moon shots.[24]

These quotations illustrate that not only archaeologists, but earth scientists generally seem bent on (1) establishing evidence for a supposed evolution of man not merely from savagery to civilization but from "earlier forms" of life, and (2) dating anything they find at maximum possible ages. Both of these ideas must eventually prove futile because man and beast really began their existence on the earth as civilized man and "after their kind", respectively only about six millennia ago.

On the other hand man has degenerated enough times, and in enough places of the world, to permit archaeologists to find real evidence for the savagery to civilization (or its reverse) transition. Real discoveries of this sort thus do not substantiate "evolution". ( Editors Note: Readers will find extensive support for the idea of degeneration of man in articles in the *Creation Research Society Annual, 1968.)*

The equilibrium radiocarbon model is popular among archaeologists, not only because it is a sophisticated modern scientific tool and practically all they have to work with, but also because it gives results often far enough removed from Biblical chronology to make them feel comfortable.

Bylinsky,[25] for instance, claimed that radiocarbon has established a date of 6750 B.C. for the deepest layers of "Jarmo", an ancient village considered to represent an early stage in the transition from savagery to civilization, and that a cave called Shanidar close to Jarmo, where "sheep bones (were found) near charcoal . . . in an ideal state for dating with carbon-14" was dated at 9000 B.C.

Bylinsky quoted others to the effect that a cave found in Iran was "occupied about 35,000 B.C. until recent times" and "a farming village . . . founded about 8500 B. C."

**Absurd Claim of Accuracy**

Also illustrative of a passion for overdating is a further statement by Bylinsky, "A variety of new scientific techniques is helping to expand the scope and meaning of the remote history of man. *First and foremost is radiocarbon* . . . which reaches about seventy thousand years into the past. . ."[26] (Emphasis added) While expressing a majority viewpoint, it is distressing that anyone would claim such accuracy for radiocarbon dating. The claim that radiocarbon is useful in dating specimens as old as 70,000 years is absurd.

Such accuracy is not even possible under the most precise laboratory conditions to say nothing of the uncontrollable and contaminated environment of nature. It would mean, for example, the ability to measure C-14 concentrations (against background radiation) to a precision of one part in 10,000 of the radiocarbon found in the living biosphere.

The usual, still greatly exaggerated, claim is that the upper limit of radiocarbon dating is about 40,000 years. Since the half life of C-14 is 5760 years, this corresponds to about seven half-life periods ($0.5^7 < 0.01$). Furthermore, the C-14 concentration would be only three percent as great at 70,000 years as at 40,000 years after death. Even 40,000 years for the resolution in radiocarbon dating would require extremely careful laboratory control quite unrealistic in the natural environment.

Moreover, such claims of accuracy ignore the possibility of even the slightest unbalance of C-14 in the earth as a whole to say nothing of the 30% observed unbalance.

In spite of feverish tendencies to expand antiquity and provide evidence of "evolution" by unrealistic claims of transitions from savagery to civilization, the assigned dates of well authenticated civilizations (Sumerian, Babylonian, and Egyptian) unearthed and described by archaeologists can, with ever growing factual information, be stretched only a millennium or so.

But the Ark landed roughly 4500 years ago on Mt. Ararat in the mountains northeast of Mesopotamia where the Sumerian and Babylonian civilizations flourished. Both these civilizations must have developed *after* Noah's Flood, sometime between the second and third millennia B. C., although archaeologists assign ages for them between three and four millennia B.C.

The difference of a little more than a thousand years is close incidentally to the correction increment obtained by applying the nonequilibrium model in recalculating radiocarbon-dated specimens about 4000 years old. Considering the magnitude and nature of Noah's Flood (in which the "earth was clean dissolved"–a mechanical not chemical dissolution (per John Woodward), one realizes that the Flood probably completely erased evidence of all antediluvian civilizations such as to leave practically nothing readable in the "history written in the rocks."

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# RADIOCARBON CONFIRMS BIBLICAL CREATION (AND SO DOES POTASSIUM-ARGON)

ROBERT L. WHITELAW*

*The C-14 method of dating not only confirms Biblical history, but creation also. Similarly the potassium-argon method cannot be used to establish ages older than about 7000 years.*

*Libby found a discrepancy indicating a non-equilibrium in the build-up of terrestrial radiocarbon. But, since he was convinced that the earth was millions of years old, he decided the difference between the C-14 production rate of 19 atoms/gm-min. and the specific activity of 16 dis/gm-min. was due to experimental error. Actually this difference is greater and is to be expected on the basis of a relatively recent Creation. Allowing for this difference and computing backward leads directly to the Biblical creation date.*

*The vulnerability of the potassium-argon method of dating lies in the difficulty of knowing how much of the argon came from potassium, a determination absolutely vital to all age determinations. Since 99.6% of argon is Ar-40 and .337% is Ar-36, the ratio of 99.6 to .337 or 295.6 would give the amount of argon coming from potassium in the equation: Radioargon 40 = total argon 40 – 295.6 times argon 36. But this* ***assumes*** *the ratio of Ar-36 to Ar-40 since the beginning. If cosmic radiation began with Creation, the* ***present*** *Ar-36 concentration of .337% would have built up from zero since then, so that the "constant" of 295.6 must increase rapidly as one goes backward in time.*

## Introduction

Despite the undisguised evolutionary presuppositions that pervade the teaching of earth sciences today, particularly in the many attempts to "fit" the dating of rocks, fossils and artifacts into approved geological time-tables, when one looks carefully at the various "time-clocks" proposed, the Biblical Creationist finds himself on surer ground than ever before.

All these time-clocks fall into two classes, the *quantitative* and the *qualitative.* The quantitative clocks are those means by which an actual age in years might be determined. The qualitative are those phenomena that indicate greater or lesser age without determination of actual years.

Of the *quantitative* clocks, only two remain in scientific favor today: the Radiocarbon Method, and the Potassium-Argon Method. All others involve shaky assumptions, each assumption often contingent on the previous.

Turning to the *qualitative* time-clocks, two facts are found common to all: 1) Many positively point to, or require, a relatively recent origin of matter 2) Not a single one can be found to *establish* the evolutionary scale of time, or the order of the geologic ages, or even to refute the Bible!

## Evolutionist Faces Dilemma

Faced with this dilemma, the evolutionist today clings desperately to the faith that Radiocarbon, and Potassium-Argon — or some new clock undiscovered-can be made to support his theories.

*Robert L. Whitelaw, is Nuclear Consultant and Professor of Mechanical Engineering at Virginia Polytechnic Institute, Blacksburg, Virginia 24060.

But when we look carefully at the basic constants and assumptions in the Radiocarbon Method, we find that it not only confirms Biblical history, but also points unmistakably to Biblical creation. And when we look with equal care at the highly-regarded K-Argon clock for dating rocks we find that it is meaningless *unless* one assumes a creation date; and one creation date turns out to be just as good as another!

In short, neither one of these much-quoted time-clocks is found to *establish* the date of any rock, fossil or artifact beyond the date of Biblical creation, namely about 5,000 B.C.

A word here is in order on Biblical creation, Does the Bible establish a date, as well as a method? In a specific sense it does not; but in a general sense it most assuredly does. The general *method* is fiat creation–a perfect natural order brought out of nothing by the word of a sovereign God. The general *time* is clearly at the creation of the first man and woman; a time delineated with sufficient clarity (Gen. 5 and 11 are not just casual genealogies!) that we can establish it about 5,000 B. C., yet also with sufficient obscurity that it is not merely an adding-machine problem as Ussher seemed to think. (See Chart 1)

## The Carbon-14 Timeclock

This ingenious method by W. F. Libby[1,2] put in simple terms goes as follows: High energy cosmic rays from outer space are absorbed in the earths upper atmosphere by knocking free neutrons out of the nuclei of oxygen, nitrogen, argon, etc. These free neutrons, emerging at high energy, are slowed down by collision with air molecules, after which most of them are captured in the nuclei of nitrogen atoms which of course are everywhere abun-

**Chart 1. Reconstruction of Approximate Chronology to Biblical Creation**

| Eras | Time | Reference |
|---|---|---|
| ERA I: Antediluvian Age (Creation to Flood) (Sources: comparison & evaluation of LXX, Hebrew, Samaritan Pentateuch, et al.) | 2000 yrs. | Gen. 5 |
| ERA II: Flood to the Crucifixion of Christ | 2980 yrs. | |
| Flood to Abram's departure (1070 yrs.) | | Gen. 11 |
| Abram to Exodus (430 yrs.) | | Ex. 12:41 Gal. 3:17 |
| Exodus to Temple (480 yrs.) | | 1 Ki. 6:1 Acts 13 |
| Temple to Babylonian captivity (363 yrs.) | | Kings and Chronicles |
| Babylonian captivity (70 yrs.) | | Jeremiah and Daniel |
| Cyrus' edict to the Cross (567 yrs.) | | Ezra 1 and Daniel 9 |
| ERA III: Present Age (since the Cross) | 1938 yrs. | |
| | 6918 | |

(Note: There is *no* reliable secualr means of dating any historical event prior to Christ *apart* from the Bible. Few historians know this, and fewer still are those who admit it. Almost all the elaborate charts and dates of ancient empires published today have been built up from Ptolemy's Canon, or supposed synchronisms with solar eclipses, or Greek archons. or olympiads, all of which methods can be shown worthless.)

dant. This capture in turn releases two isotopes, Carbon-14 and monatomic hydrogen, H-1. The C-14 soon combines with the oxygen of the air to form radioactive carbon dioxide which diffuses uniformly throughout the lower atmosphere along with natural carbon dioxide.

The radiocarbon in the carbon dioxide of the atmosphere thus enters into the "carbon exchange cycle" by which all life is sustained. On land, by the action of photosynthesis (in sunlight), all vegetation removes $CO_2$ from the air. converting it into new growth, flower and fruit. Herbivorous animals eat the vegetation, and carnivorous animals eat other animals, thus diffusing the $C0_2$ from the air throughout both vegetable and animal kingdoms. Meanwhile, all air-breathing animals take the oxygen of the air and exhale carbon dioxide from their bodies, thus completing the cycle.

In the sea, a similar cycle prevails. Phytoplankton remove the dissolved carbon dioxide and are then eaten, and shellfish exchange carbon dioxide for carbonate and bicarbonate ions in forming their shells.

The "turnaround time" for this cycle has been estimated as 500 to 1,000 years; so that after several thousand years from creation, all *living things* in the carbon exchange reservoir should be uniformly radioactive with each other and with the earth's atmosphere, *provided the intensity of the cosmic rays striking the earth varied little over a thousand years.*

This was Libby's first assumption, which was reasonably substantiated by samples of flora and fauna from many parts of the earth. and the atmosphere itself, all showing specific activities between 14.5 and 16.3 disintegrations per minute per gram.

### Death Starts Radiocarbon Clock

Now consider what happens when a living organism dies, whether plant or animal, for it is here that the C-14 clock begins to measure time.

At the instant of death, exchange of carbon with the world reservoir ceases, while the fraction of radiocarbon which was present at death continues to decay at the uniform rate (exponential) by which 50% changes back to nitrogen every 5568 years (this being known as its "half-life"). Thus, if a dead organism-whether it be a piece of wood out of Pharoah's tomb, a fossil leaf or bone-is analyzed for radioactivity centuries later, its intensity will be 50%, after 5568 years, 25% after 11,136 years, and so on.

(Editor's Note: Half-life for carbon is an estimate, and 5568 years, has been preferred. More precise values might be 5730 years or 5760 years.)

With such knowledge, it would appear to be a simple matter to calculate the elapsed time since death of such a specimen, provided that (a) no seepage of water or other factor had added C-14 to the specimen since death, and (b) *the fraction of radiocarbon it possessed at death is known.*

The first proviso can be met by selecting specimens with great care. The second is much more difficult. Libby and his colleagues tackled it as

follows: They reasoned that if the *present rate of production* of radiocarbon in the atmosphere can be shown equal to the *present rate of disintegration,* then we could safely assume that cosmic radiation has remained constant at its present value throughout the history of living matter. (This assumption is not strictly valid for several reasons, but let us examine what they found.)

The *average* rate of production of free neutrons by cosmic rays in the outer atmosphere was computed by measurement to be 2.6 neuts/$cm^2$ per second.

The production rate of radiocarbon was assumed equal to the "neutron production rate, since each neutron soon finds a nitrogen nucleus and produces an atom of C-14, except for about 1% which produce tritium.

The total amount of carbon in the world exchange reservoir was next estimated by careful analysis, and found to be:

| | gm/sq. cm. earth's surface |
|---|---|
| In ocean "carbonate" | 7.25 |
| In ocean dissolved organic | 0.59 |
| In biosphere and atmosphere | 0.45 |
| Total | 8.29 |

Dividing the neutron production rate of 2.6 by the 8.29 grams of carbon in the exchange reservoir (for 1 sq. cm. of earth's surface) gives a *specific* production rate of radiocarbon today equal to .314 atoms/gm-sec, or 18.8 atoms/gm-minute.

**Production, Disintegration Differ**

When Libby compared this production rate of 18.8 with the specific activities between 14.5 and 16.3 which he had found, he reconciled them by the statement: "the agreement seems to be sufficiently within the experimental errors involved so that we have reason for confidence in the theoretical picture. . ."[3]

That is to say, even though the present production rate of radiocarbon *differs* from the present disintegration rate (with the best of valid corrections applied) by almost 20%, *they were assumed to be the same.* For one reason this made reading the timeclock easy. But even more, if the discrepancy were allowed, a recent origin of cosmic radiation would also have to be allowed, which was unthinkable. Quoting Libby directly:

> If one were to imagine that the cosmic radiation had been turned off until a short while ago, the enormous amount of radiocarbon necessary to the equilibrium state would not have been manufactured, and the specific radioactivity of living matter would be much less than the rate of production calculated from the neutron intensity. . .[4]

Thus, despite the discrepancy of almost 20% shown above, the investigators proceeded to reason that no such "turning on" of cosmic radiation could have occurred, and that "there exists at the present time a complete balance between the rate of disintegration of radiocarbon atoms and the rate of assimilation of new radiocarbon atoms for all material in the life-cycle."[5]

Still later, the dating method was applied to ancient matter. Yet no date older than about 30,000 years was found. A matter of no small consternation among uniformitarian scientists, to whom 30,000 years is just yesterday.

**Potential Means of Adjustment**

What then is the truly objective approach to the radiocarbon production and disintegration rates reported? Clearly, it should be compared with the *total* scientific data before us, of which the Biblical record itself is a most important part, not lightly to be ignored. And in doing so, the Creationist quickly notes that the observed deficiency between disintegration rate and production rate is exactly what one would expect if Biblical creation be true. To explain the relative magnitudes of the two rates a number of possible explanations lie before us:

(1) Intensity of cosmic radiation has been constant since creation, giving the production rate of 18.8 C-14 atoms/gm.-minute calculated by Libby. The *present* average specific activity in the carbon-exchange reservoir of 16.1 dis/gm.-m. then leads us back to a creation date of 15,000 years ago. (See Figure 1)

(2) The cosmic radiation today is producing neutrons (and therefore C-14 atoms) at a rate more like 3.5 per second per sq. cm. of earth's surface, i.e., 35% higher than Libby estimated. The higher value is adequately supported by the 4% to 1 variation with latitude, and the 5:1 variation with altitude reported in Libby, 1955.

A similar re-evaluation of carbon in the exchange reservoir, in the light of data by Rubey[6] warrants reducing the amount from 8.29 to about 7.8 gm./sq. cm. The new and better value of specific production rate of C-14 atoms would then be 3.5/7.8 giving .45 atoms/gm.-sec. or 27 atoms/gm.-minute.

If 27 atoms/gm.-min. have been produced on the average since creation, and the present disintegration rate is only 16.1, this indicates creation about 7,000 years ago in accord with Scripture. (See Figure 2)

Thus it is that the Carbon-14 timeclock discovered by modern science not only points clearly to an early "turning on" of cosmic radiation, i.e., a universe that appeared quite recently;

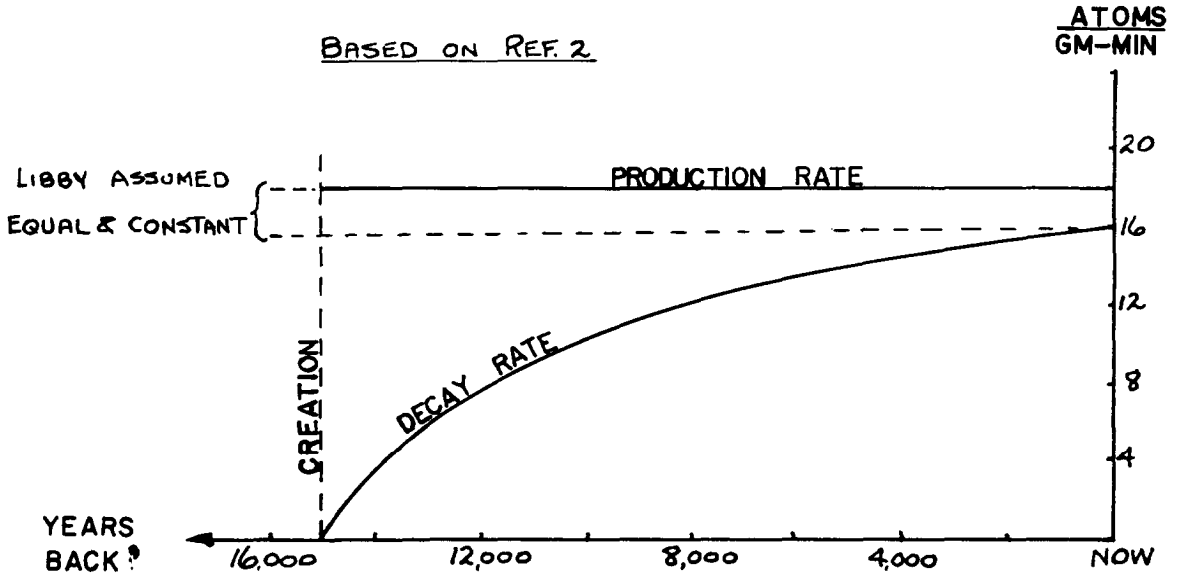


**Figure 1. Possibly the intensity of cosmic radiation has been constant since creation, giving the production rate of 18.8 C-14 atoms/gm.-minute calculated by Libby. The present average specific activity in the carbon reservoir of 16.1 disintegrations/gm.-minute then leads back to the creation date of 15,000 years ago.**

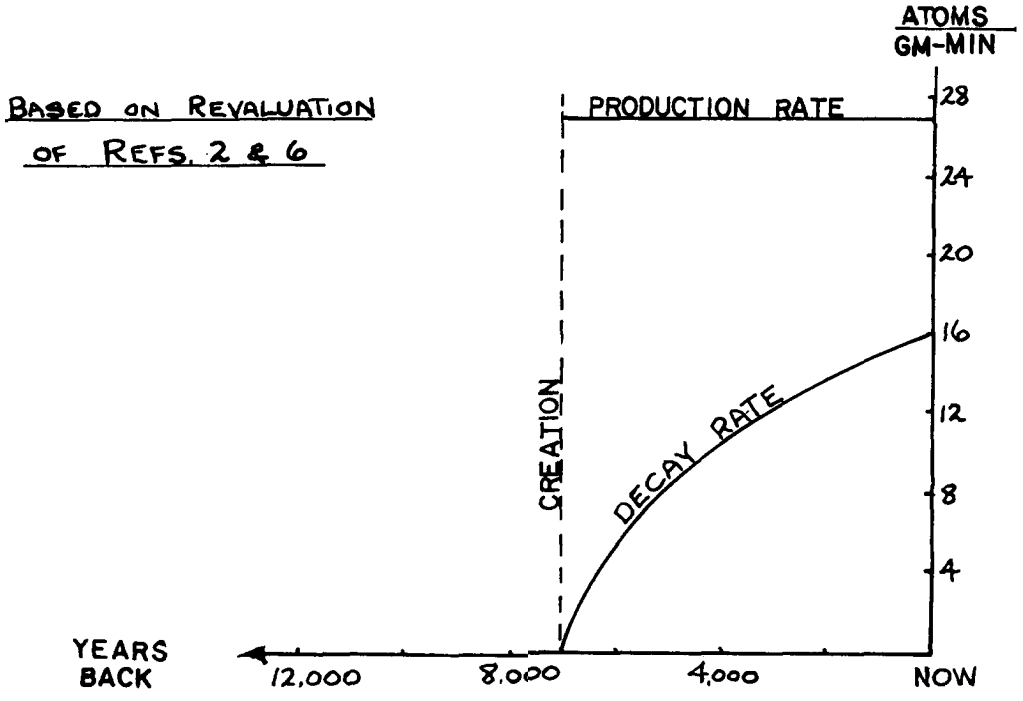


**Figure 2. Cosmic radiation today is producing neutrons and therefore C-14 atoms at the rate of 27 atoms/gm.-minute. If 27 C-14 atoms/gm.-minute have been produced on the average since creation, and the present disintegration rate is only 16.1, this indicates creation about 7,000 years ago in accord with Scriptures.**

but even better, the closer one examines the hands of this clock the more one confirms the very chronology of Scripture-as every true scientist should expect.

### The Potassium-Argon Timeclock

Let us look now at the second timeclock to which scientists today have turned, finding scant support for their geologic ages in the Radiocarbon Clock.

The Potassium-Argon dating method is extensively analyzed in a recent book by Schaeffer and Zahringer[7]. The concept is basically simple except that it involves a thoroughly unscientific assumption which nullifies the whole method, as will readily be seen.

First, it was discovered (in 1905) that all natural potassium is radioactive, and second, that its beta activity is due to the tiny fraction of K-40 which it contains (12 parts in 100,000). It was then found that K-40 decays simultaneously in two ways, 92% of the decays being by gamma emission, and 8% being by electron, or beta-emission.

This latter emission has a half-life of 1.31 billion years and converts an atom of metallic K-40 into an atom of gaseous Argon-40. That is to say, every 1,310,000,000 years half of the original K-40 (which was less than 1/10,000th of the original potassium) would appear as Argon-40 gas.

Now since potassium-bearing rocks are plentiful in the earth's crust, this timeclock seemed made to order to verify the multibillions of years postulated by evolutionary geology. Only two problems needed to be solved: (1) how to measure the fantastically small quantities of argon trapped in the rock specimen?, and (2) how to determine what portion of this argon, in all those billions of years, came from potassium decay, and what portion came in from the earth's atmosphere where, unfortunately, it is very plentiful (almost 1% by volume)?

About 190 pages of Schaeffer and Zahringer's report are devoted to explaining the brilliant techniques by which the first problem has been solved, and to citing the many ancient dates thereby affixed to sediments, rocks and meteorites of all kinds. Only two pages (7-8) are given to solving the second problem–how much of the argon came from potassium decay?–a solution which is absolutely vital to any age determination.

It is this problem, and its solution, which demands careful scientific examination.

### Potassium to Argon Decay Studied

Since argon accounts for almost 1% of the earth's atmosphere, over a period of many years some atmospheric argon will be absorbed into any sample being taken. However, and this is of vital importance, the atmospheric argon trapped in a tiny sample of internal potassium that has supposedly been decaying for billions of years *would have the isotopic distribution of billions of years ago* which would by no means be that of today.

Now isotopic distribution in atmospheric argon today is 99.6% argon-40, 0.337% argon-36 and 0.063% argon-38, all the isotopes being stable. Armed with this information, the Potassium-Argon Method was then constructed on a brilliant deduction based upon a colossal oversight!

It was deduced that, if the tiny sample of argon taken in a rock specimen contained an infusion of atmospheric argon, it would show up by the presence of Ar-36, since the argon that decayed from potassium in the specimen would be pure Ar-40. (The trace of Ar-38 was dismissed as too small to be detected). This being so, it becomes a simple matter to measure the quantity of Ar-36 in the specimen, multiply it by 295.6 (i.e. the Ar-40/Ar-36 ratio in the air) to determine the amount of Ar-40 that came in from the atmosphere, and finally subtract this amount from the total Ar-40 found. Thus, the remainder would be the argon-40 formed over billions of years from potassium alone. The equation for this operation is given[8] as:

$$\text{Radioargon-40} = \text{Total argon-40} - 295.6 \times \text{argon-36} \quad (1)$$

And the colossal assumption behind this equation, without a shred of data or logic to support it, is that over the eons of time the radioargon was being formed, the ratio of Ar-36 to Ar-40 in the atmosphere *has remained exactly the same as it was the day the rock was formed.* One could scarcely find a more glaring example of the blinding power of the uniformitarian faith!!

### Facts Nullify K/Ar Timeclock

What then are the scientific facts and probabilities that nullify the above assumption, and even turn the hands of this timeclock toward creation?

**First,** it can be shown that Ar-36 is a probable product of cosmic radiation bombarding the earth's outer atmosphere, just as is radiocarbon. Several nuclear reaction sequences leading to Ar-36 in the presence of free energetic neutrons and photons can be shown.

**Second,** it follows that over a billion-year span (assuming such a span really occurred!) the Ar-36 in the atmosphere would have slowly increased compared to the Ar-40, barring some process of Ar-36 destruction not yet found.

**Third,** it follows that if cosmic radiation began with creation only a few thousands of years back, the present Ar-36 fraction may easily have built up from zero even in that short time.

**Finally,** then, it follows that the constant "295.6" in equation (1) must increase rapidly with specimen age, and for a specimen which trapped a piece of atmosphere at the instant of creation it would be highest of all, and completely unknown.

The conclusion is that equation (1)–but with a totally unknown constant-is just as valid for rocks formed at a Creation 7,000 years ago, as for rocks formed at a Creation 7,000,000,000 years ago. It tells absolutely nothing about the date of the rock until one first assumes a date of creation and a rate of buildup of Ar-36 in the air thereafter. Only then can the constant even be estimated, much less be determined exactly.

In closing it should be noted that the basic equation (1), even as it stands, is used to determine quantities of radioargon (left side of equation) in *trillionths* of a cubic centimeter, as the *difference* between two quantities on the right side each a thousand to ten thousand times greater. Every scientific investigator knows how untrustworthy is such a procedure. In this particular case the probable error in the result is well over 50%.

The errors of ±10% cited for many samples in the latter pages of Schaeffer and Zahringer are estimated gravimetric errors only. The authors apparently ignore the dominating influence of uncertainty and variations in the constant 295.6 which of course swamps out all others.

This then is the timeclock without hands-without even a face—upon which evolutionary faith now depends to prop up its desperate belief in a world that never began, a creation that never occurred, and a Creator who never created and no longer exists!

And the record of Scripture was never so sure!

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## ON THE INVARIANCE OF THE DECAY CONSTANT OVER GEOLOGICAL TIME

ROBERT V. GENTRY*

*Radioactiue inclusions such as zircon, which show a considerable volume increase due to isotropization from radioactiue decay, often fracture the surrounding mineral in a random pattern. On uniformitarian concepts the surrounding mineral should expand slowly over geologic time. Expansion cracks should occur first along cohesion minimums and grain boundaries, but instead individual cracks surrounding the radioactive inclusion are randomly distributed and occur suddenly, in an explosive fracture. Anomalous decay rates would explain this world wide phenomena. Mathematical equations showing the relationships involved in pleochroic halos are given.*

While the past several years have seen steady advances both in the techniques and precision with which isotopic ratio determinations are made, there has been relatively little discussion about the fundamental premise that translates these data into radiometric ages, namely, the invariance of the decay constant lambda ($\lambda$) over geological time.

### Pleochroic Halos: a Test

It was noted early in the study of radioactivity that pleochroic halos presumably furnished an ideal way to test this premise via observing the ring structure of uranium-238 and thorium-232 halos in ancient rocks. The rationale was that since the halo ring radii (R) develop as a result of alpha emission from uranium-238 or thorium-232 and their respective daughter products, any change in $\lambda$ would be reflected in a change in ring radii.

For example, if the alpha ranges were known in minerals of varying geological ages, then the Geiger-Nuttall Law[2] in the form

$$(1)\quad \ln \lambda = A + B \ln R_a \dagger$$

(A and B are parameters and $R_a$ is the alpha range in air.)

and the Bragg-Kleeman Rule[3]

$$(2)\quad R_m = CR_a$$

($R_m$ is the alpha range, i.e., halo radius in the mineral; C is a parameter dependent on the mineral.)

may be combined to yield an expression equation for the fractional change in $\lambda$ due to any variation, delta $R_m$, ($\Delta R_m$) in the halo radius:

$$(3)\quad \Delta\lambda/\lambda = (1 + \Delta R_m / R_m)B \sim B(\Delta R_m / R_m) \text{ for } \Delta R_m << 1.$$

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*Robert V. Gentry is associated with the Institute of Planetary Science, Columbia Union College, Takoma Park, Maryland.

†This equation should be read: "The natural logarithm (ln) of the decay constant lambda (A) equals A + B times the natural logarithm of the alpha range in air, Ra."

### Variation in Decay "Constant"

Surprisingly enough, on the basis of this theory Joly[4] earlier reported a possible variation in the uranium-238 decay constant from his extensive studies on radioactive halos. Later Kerr-Lawson[5] and Henderson[6] in their investigations on halos in Canadian Pre-Cambrian mica concluded there had been no change in l.

However, as Picciotto and Deutsch[7] point out, the logarithmic nature of equation (1) makes it difficult to present convincing arguments for the absolute invariance of l. I have found after examining many uranium and thorium halos[8] that the experimental difficulties in measuring the exact outer boundary of the various rings, plus the problem of accounting properly for the finite size of the central radioactive inclusion, contribute to a minimum uncertainty in $R_m$ of about D $R_m$ = 0.1 m (micron) for a given set of measurements. (Note: A micron is the equivalent of $10^{-4}$ cm.)

It is probably not generally known, but due to the nature of the experimental method, this essentially establishes a minimum uncertainty in l as

(4) $Dl/l = B\,(D R_m/R_m) \sim ½$ for uranium 238.

This result is conservative in the sense that other uncertainties, not included in the above computations, arise when ring radii in various minerals must be compared.

Furthermore, Henderson[9] measured differences of three to four percent in halo radii for the same alpha emitters (polonium isotopes) in different halo types, and my own measurements have corroborated this variation. Though as yet unexplained, it is likely that some of this difference is due to the advanced stage of development of the polonium halos where the coloration will extend to the full alpha range and not just to the peak of the Bragg ionization curve.

### Another Problem Noted

A more subtle problem and one which has received little discussion is whether any discontinuities have occurred in the space-time continuum such that one or more non-statistical decay periods may have transpired over geological time.

In other words, have periods of time D T ever existed such that for sub-intervals D t << 1 sec., l (D t) did not represent the probability of a single radioactive atom decaying within D t? These periods would be characterized by the decay rate proceeding at an anomalous rate while the alpha particle energy would remain fixed, for there would be no change in the parameters of the nucleus.

The range of the alpha particles emitted during these time periods would therefore remain unchanged, and hence no change in the radii of the various rings in the uranium-238 and thorium-232 halos would be expected. The usual arguments for the invariance of l from pleochroic halo radii data as presented above would therefore no longer be applicable. This type of discontinuity in the space-time continuum is not to be confused with the analysis of a very different problem; i.e., the determination of the invariance of (l) in the presence of a relativistic time dilation[10].

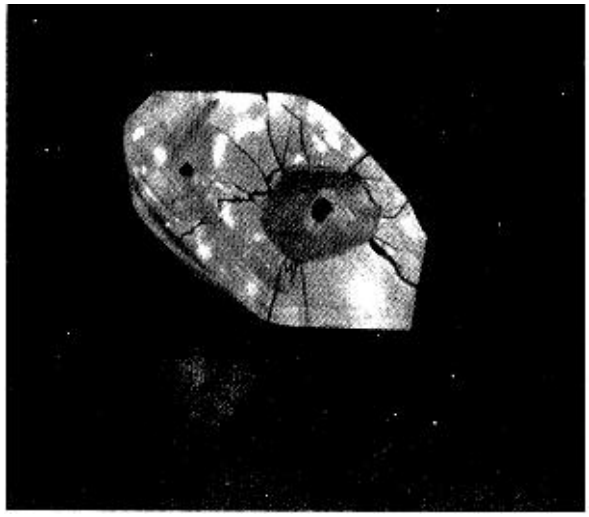

**Figure 1. Zircon from "Rapakivi." The isotropic central part fractures the non-isotropic outer zone. (250x)**

The question may be raised as to what experimental evidence may be adduced that would tend to support an anomalous decay rate hypothesis.

### Evidence of Anomalous Decay

Ramdohr[11] in his extensive mineral studies has observed radioactive halos in polished mineral sections which exhibit an unusual appearance. Radioactive inclusions (such as Zircon), which show a considerable volume increase due to isotropization from radioactive decay, have in numerous cases been observed to fracture the surrounding mineral in a random pattern.

Ramdohr points out that the surrounding mineral should expand slowly over geological time due to radioactive isotropization, and individual cracks should appear as soon as the elastic limit is reached. He further points out that, while these expansion cracks should occur first, along cohesion minimums and grain boundaries, *nothing like this happens.*

Individual cracks surrounding the radioactive inclusion are randomly distributed and evidently occur quite suddenly in the form of an explosive fracture and not a slow expansion. Figure 1 shows a photograph (due to Ramdohr) of such a phenomenon wherein the isotropic central inclusion fractures the non-isotropic outer zone. The occurrence of this phenomenon is worldwide in extent.

### Conclusions

While there might be other alternatives, one possible explanation of these "fractures" or "blasting" halos is that the rate of radioactive decay was at one time greater than that observed today. The isotropization of the host minerals would have occurred very rapidly due to an anomalous decay rate, and hence fracturing of the outer mineral would be expected.

Whether further investigation will prove this hypothesis correct or not, it would seem premature to claim that all the problems relating to the invariance of $\lambda$ over geological time have been solved. There is, then, *no conclusive* evidence that isotopic ratios of radioactive decay nuclides represent elapsed time as is usually considered the case.

### Acknowledgment

I wish to express my appreciation to Dr. Paul Ramdohr, University of Heidelberg, for the helpful discussions relative to the fracture halos His assistance in supplying mineral sections and a photograph for this paper is also gratefully acknowledged.

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## A PALEOECOLOGICAL MISINTERPRETATION

HAROLD G. COFFIN*

*The small marine tubeworm, Spirorbis, is abundant in the fossil record. No member of this genus is found in a fresh water habitat. Since Spirorbis tubes are found as a constituent of Carboniferous coal, they are strong evidence for the allochthonous, or transported, origin of much of the coal. This is contrary to the presently popular view that coal originated in swamps and marshes due to the accumulation of plant materials over long periods of time.*

In attempting to understand the environments and relationships of ancient living organisms, a discipline called paleoecology has developed. Interpretations, which of necessity must be tentative because of the subjective evidences on which they are based, are unavoidably influenced by the researcher's concepts of time and geological processes during the earths past history.

A strained interpretation has been given the small marine tubeworm, *Spirorbis.* This worm, which secretes a calcareous tube for protection of its fragile body, is ubiquitous in the modern oceans of the world. Because the diameter of the whole coiled tube, which has the appearance of a small snail, is not usually over 2 mm., it can be easily overlooked. It is a sessile organism which attaches on one side to any suitable substrate such as corals, mollusks, bryozoans. and other invertebrates. Floating sargassum or gulf-weed is also covered with many *Spirorbis* tubes and furnishes a planktonic environment[1].

### Description and Classification

This worm is hermaphroditic, spawns during high spring tides, and releases its larvae a certain number of days later.[2] In keeping with other organisms of this class, it produces free-swimming trochophore larvae, which move by means of bands of cilia which circle the oval-shaped body[3]. They are positively phototaxic when first released into the water, but usually become negative about three weeks later when metamorphosis commences. A negative reaction

*Harold G. Coffin is Research Professor at the Geoscience Research Institute associated with Andrews University, Andrews, Michigan 49104.

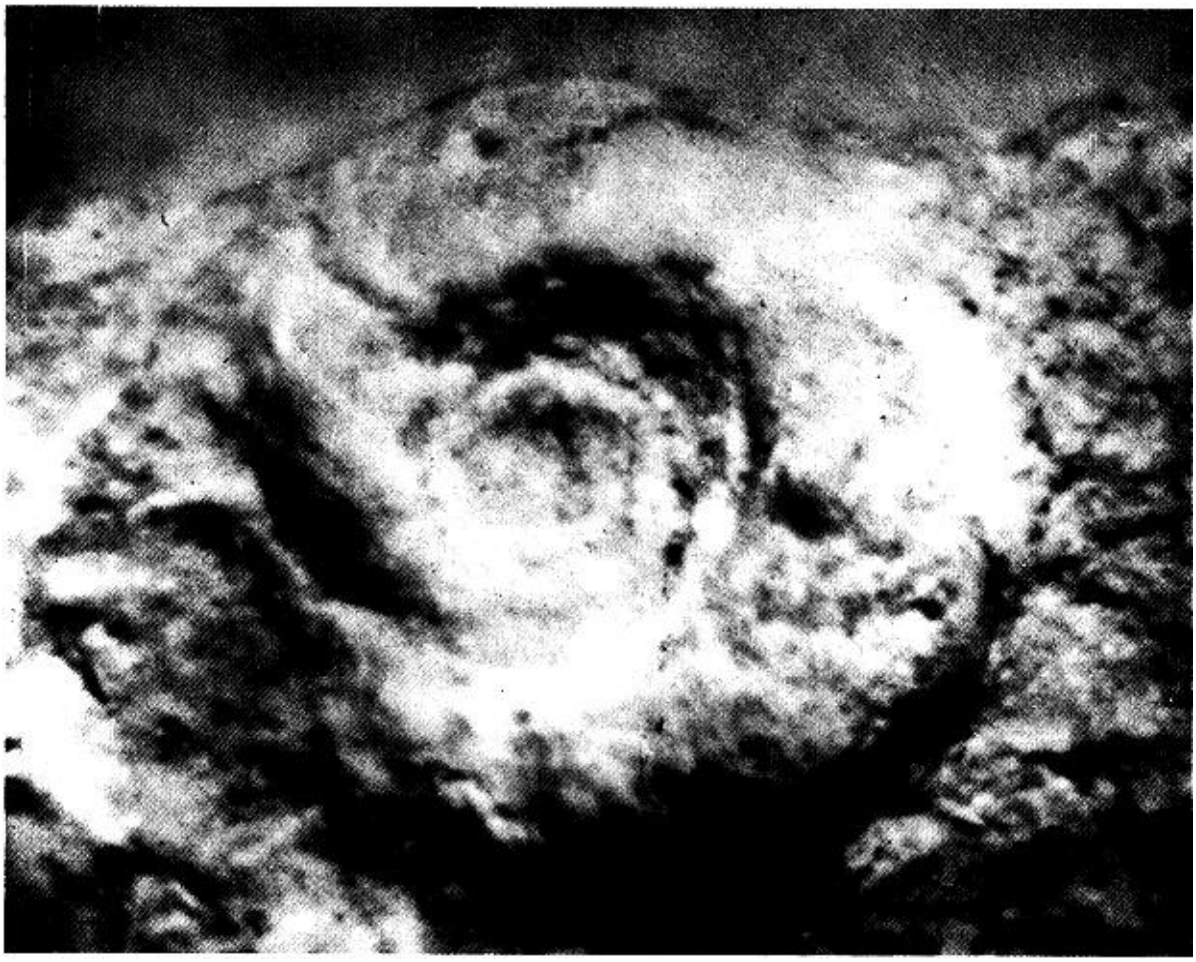

**Figure 1. Enlargement of white calcareous tube of *Spirorbis* in fossilized condition.**

to brackish or fresh water prevents the larvae from settling in unfavorable environments[4].

No member of the family Surpulidae, to which *Spirorbis* belongs, is found in an aquatic (freshwater) habitat, although the small coiled tubes of *Spirorbis* are abundant along the shores of the Black Sea, which has a salinity of approximately 18% at the surface, as compared to an average of 35% in most oceans[5]. In fact, the whole class, Polychaeta, is marine except for a few rare examples. Certain other groups of marine invertebrates in other phyla also have trochophore larvae, but *no examples of freshwater organisms with trochophore larvae have ever been reported.*

### Abundant Samples in Fossil Record

*Spirorbis* is abundant in the fossil record, being found in all periods from the Ordovician to the Recent. The white calcareous tubes are so similar to those now living in the oceans that there is no hesitancy about placing them in the same genus. Attempts to designate species among fossil specimens have not been very successful.[6] Marine fossils often carry attached *Spirorbis* tubes. Their arrangement on some pelecypods suggests a commensalism whereby the worm benefited from the water currents caused by the feeding of the clam.[7]

If coal deposits are not allochthonous (transported), but have originated from swamps and marshes where plant materials have accumulated to considerable depths over much time–the present popular view, then the discovery of marine organisms within the coal would not be expected. Usually coal is quite devoid of animal fossils, although there are numerous exceptions. However, *Spirorbis* is a frequent constituent of Carboniferous coal-measures. They are found attached to plant debris and mixed into coal seams. They also may be cemented to any marine organisms that are present.[8] This has been known from the time when coal and associated strata were beginning to receive detailed attention over 100 years ago.

### Initial Incredible Interpretation

The swing in the early eighteen-hundreds by geologists to concepts of uniformity and geological ages influenced the paleoecological interpretation of *Spirorbis.* Obviously the "bog theory" of coal formation cannot accommodate the abundant presence of a marine organism. Through the years this small annelid has been declared a salt-water worm throughout the geologic column except in the coal measures, where the supposed evidences for the *in situ* origin of coal made difficult the interpretation of *Spirorbis* at its face value.[9,10,11,12]

Consequently, seemingly without much question on the part of geologists and paleontologists through the decades, this worm when found in coal and coal-bearing rocks, has been designated a *fresh-water* dweller. This position has been taken despite the facts:

(a) that *Spirorbis* today is completely limited to the marine environment,

(b) that it reproduces by means of a trochophore larva, which, though characteristic of several marine phyla, is unknown for any fresh water invertebrates, and

(c) that it is associated with obviously marine organisms throughout the geologic column, including the Carboniferous period.

*This highly questionable interpretation is a good example of the influence of a prevailing (ruling) theory.*

### Conclusion

Taken at face value, *Spirorbis* in coal and on plant fragments gives strong evidence for the allochthonous origin of much of the coal. Even as today the drifting Sargassum seaweed provides an attachment surface for *Spirorbis, so* flotsum of *Sigillaria, Lepidodendron, Calamites, Cordaites* and other coal-forming plants became spotted with the coiled tubes of this small worm. When depositing conditions buried the masses of vegetable material under sand and silt, the worms were buried also.

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*(Continued from Page 68)*

ray-produced neutrons before they had opportunity to react with nitrogen in the atmosphere;

(3) removal by rains during and after the Flood of a large portion of the carbon dioxide characteristic of the pre-Flood atmosphere and conversion of this carbon dioxide to precipitated carbonates and carbonates carried in solution by the post-Flood oceans. (It has been reliably estimated that the carbon in the Earth that is not presently contained in minerals or fossils is distributed: 86.2 percent in solution in the oceans in a chemical form not directly associated with organic material, 8.7 percent in organic material contained in the oceans, 3.5 percent associated with organic life on land, and 1.6 percent in the atmosphere).

Thus it seems that continuing developments in the investigation of radioactive dating are certain to bring yet broader and more firm support for the information God has given to us through the written word.

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*(Continued from Page 64)*

chemistry, physics, astronomy, geology, and philosophy of science are covered. The program is absolutely true to the Bible.

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# COMMENTS ON SCIENTIFIC NEWS AND VIEWS

HAROLD ARMSTRONG*

## Clay Tablets Dated

A recent article gives us some evidence pertaining to dating by radioactive carbon, and at the same time suggests what might be for us a fruitful line of thought[1].

At the site of an ancient village at Tartaria, Romania, a few clay tablets were found, inscribed with signs like those used in Sumeria and also in Crete. Attempts to date the remains by radioactive carbon gave dates around 4000-5000 B. C., but if these tablets were really copied from Sumerian ones, or brought from Sumeria, it is suggested that their date should be about 2000 B. C., or even more recent.

It is concluded that the carbon gave too old a date, and, indeed, that there is evidence that ". . . the entire sequence of carbon-14 dates obtained for Neolithic Europe north of the Mediterranean is both too early and too long."

The article was mainly concerned with the appearance, so far from Sumeria, of signs of the Sumerian kind. The conclusion was offered though, that there was much more communication between different parts of the Middle East, and of the Mediterranean regions, in those early days than one might have expected. Indeed, another article suggests that there was much trade, and that the whole region was more nearly one cultural unit than a collection of isolated tribes[2].

These articles interested me for another reason; the weight which they allow to evidence which an ordinary man would consider very inconclusive. For instance, much is made of the fact that some of the tablets have a hole through them, while others have not. But have we not to this day both loose-leaf paper and plain sheets?

Would it not be the most natural thing in the world, if certain tablets were to be kept together, to punch them and string them on a cord? Incidentally, this would correspond to a bound book, just as the clay cylinders used in Assyria would correspond to a scroll.

Again, some of the tablets were ruled–divided into squares, one for each sign. But do we not use both ruled and unruled paper? We need to ask ourselves such questions as: What would some future archaeologist interpret, going on our principles in excavating one of our cities, if he were to find, as one of the best-preserved ruins, the archery club?

*Harold Armstrong is a faculty member of the Queens College, Kingston, Ontario, Canada, and holds a Masters of Science degree from Queens University.

## Confusion After Babel

Finally, may the resemblance of the Tartarian and Sumerian tablets not point to something more than just trade? May it not point to the dispersion of people after the tower of Babel? For the tower was in the Sumerian regions; in fact, "Sumer" and "Shinar" are almost the same name; for "s" and "sh" might be interchanged, as might "m" and "n"; in the Semitic languages the vowels are changed easily.

Suppose, then, that the various groups, spread out, after the confusion, many of them to the west. Naturally they might take with them written records, or make fresh copies, whether or not they completely understood the writing after the confusion.

Naturally they would leave signs of agriculture mixed with hunting. The course of events would be like that during the nineteenth century, when styles of furniture, of writing, etc., were carried from the Atlantic seaboard all across North America. So what is suggested, then, is that many, at least, of the remains commonly called "Neolithic" really are from the dispersion after the tower of Babel.

It is a fact that archaeology, where it has been extensive, has agreed with the Biblical record. For the most part, the investigation in detail has taken us back to say Abraham's time–about 2000 B.C. Would it not be worth while for us to try to relate earlier sites and remains to the earlier part of the Biblical account? Now the Flood must have destroyed largely any remains of earlier times; between the Flood and Babel evidently only a small region was inhabited (although that may not be a necessary interpretation of the account), so it is from Babel on that investigation might be most fruitful. May I urge readers to give this matter some thought?

## Ocean Floor Changes

A recent number of the journal *Science* contains two articles which might be of some interest to us. One concerns some studies made by seismography of the bottom of the ocean off Chile and Peru.[3]

It seems to have been believed that the floor of the ocean was spreading toward the continents. At the edge of the continental block, the floor was supposed to "underthrust" the continent somehow; and presumably sediment, carried along by the spreading, would accumulate at one place.

The fact, though, is that there is no such accumulation as was expected. To seaward, there

is, for the most part, a layer of sediment 150 meters or so thick. The trench in the floor of the ocean, which there is more or less parallel to the shore, is almost empty of sediment in the northern parts, and contains a kilometer or so of sediment in the southern. It is claimed that the trench is at least as old as the Pliocene, and presumably the same would be said about the associated features.

Many of us probably care little about the spreading, (or lack thereof), of the ocean floor. But the findings mentioned in this report may be of some use in thinking about what happened after the Flood, when the continents rose. Also, the small amount of sediment should (as has been pointed out before) supply some evidence for a young Earth.

### Age of Bristlecone Pines

The other article in *Science* is about the bristlecone pines in the White Mountains of California. and in particular about examination of their annual rings.[4] It is claimed that a succession of rings has been traced back for 7100 years. But this involved using dead trees, the oldest living ones being estimated to be about 5000 years old.

This work is of interest because the times involved are of the same order of magnitude as the times to the Flood and to the Creation, according to the traditional chronologies. The process of comparing the pattern of one tree with that of another is discussed, and the difficulties can be seen.

It is mentioned that tree rings and radioactive carbon often do not agree, at least for the older trees. Strangely enough, the tree rings seem to give older dates than does the radioactive carbon. Yet there is other evidence, as we know, that dates from radioactive carbon may be already too old.

Should we suspect, then, that the tree rings may likewise give too great ages? Is it possible, for instance that for some time after the Flood the climate was such that several rings grew each year? (as happens occasionally now)? If this should be so, it might help us in deciding what happened, in matters of climate and so on, after the Flood.

Again, some of the trees are considered to be "sensitive" to yearly variations in weather; others are not, their rings being all about alike. Such a distinction, of course, carries with it the danger of finding what one wants to find,

In any event, this article could be of considerable interest. Some of our members live near common locations of these trees; it may be that they could tell us more about them.

### Biosatellites and Radiation

Two remarks in the literature on the recent "Biosatellite II" may be of interest. One reference is an article in *Nature,* under the title: "Biosatellites Are a Waste of Money."[5] The argument is that, while the first experiments may have been of some use, there is no evidence that anything worth while will be learned by continuing them.

The other reference, in the *New Scientist*,[6] reports that mutations and damage from radiation to living things carried in the satellite was greater than had been expected. It seems that the condition of "zero gravity" (really of free fall) somehow makes the things more vulnerable to radiation; in fact there seems to be some evidence that "zero gravity" alone can cause mutations or other types of trouble.

As for the first matter, it affects us only to this extent. Many people feel that there is much waste of money—public money—nowadays on useless "research." We Christians can, first of all, keep our own hands clean in this respect. Maybe we can do more. Christians-sometimes a minority of them, it is true—have before now served as the conscience of the community. Can we serve as a conscience to the scientific community?

If we are known to be honest in such matters– if we say frankly that some proposed research is not worth while, even though we might profit materially thereby—will that not be a good witness, both to our Christianity and to our cause of Creationism? Incidentally, the scientific community may need a conscience for other matters besides those monetary, but that is another story.

The second observation may help us in that it shows another difficulty in the notion that the first living things may have been carried here somehow from another planet. (A rather useless suggestion anyway, for it merely postpones the problem; it by no means solves it.) The fact that "zero gravity" can cause trouble is of interest in showing once more how closely the earth and its inhabitants are fitted to each other. (Isaiah 45:18, Psalm 115:16)

### Negroes and Population Increase

Negroes in the United States may furnish a good example of this natural growth of a population, a thing of interest in any Creationist view of the history of the world.

According to an encyclopedia[7], the numbers of Negroes in the United States at various dates were about as follows; 1790: 700,000; 1800: 1,000,000; 1830: 2,000,000; 1860: 4,000,000; 1900: 9,000,000; 1955:15,000,000.

When these numbers are plotted on semi-logarithmic scales, the period from 1800 to

1900 gives a straight line, which indicates a constant rate of increase (i.e., in per cent per year). And the rate of increase corresponds to doubling of the population in 31 years. The rate before 1800 was greater; maybe immigration was important then. After 1900 it was less; this maybe came about as more of the Negroes moved into cities.

Actually, the nineteenth century may serve our purpose very well. There was little immigration or emigration. The slave trade was prohibited in 1808; and, while there may have been some smuggling thereafter, it would have been offset to a considerable extent by the loss of those who escaped to Canada or elsewhere. Many of the Negroes lived under rather primitive conditions, so that modern medicine has little to do with the matter, except, perhaps, to the extent that there were no great plagues.

So, on the whole, the rate of increase which we have found might be expected to be similar to the increase that might have been found in many places in Biblical times. In the light of this we can say that the rates of increase in the first few hundred years after the Flood, or while the Children of Israel were in Egypt, are not at all unbelieveable, but rather just what would be expected. What is unbelievable is that the race could have existed for hundreds of thousands of years, and not be much more numerous than it is.

### A Problem: Production of Helium

A recent article discusses the question of the amount of helium in the universe. The author says, in part:

> At one time it appeared that all objects in the universe for which a helium abundance could be obtained contained at least 25% helium by mass. This led to the suggestion that most of this was due to primaeval helium production in the early stages of an expanding universe . . . More recently doubt has beem cast on this simple explanation as a number of stars have been discovered which apparently have a very low helium abundance . . . other requirements of cosmological theories must not be forbotten . . the formation of galaxies is not understood in any of the very simple cosmologies . . . with the conventional theories of stellar evolution it is difficult to see how all of the observed helium could have been produced in a galactic lifetime of $10^{10}$ years[8].

In other words, the theories which begin: "In the beginning hydrogen. . . " (or whatever it may be), are in trouble for yet another reason. How much surer a foundation is the fact: "In the beginning God. . . "!

### New "Living Fossils" Found

D. Wall and B. Dale[9] discuss the fact that many types of plankton, lately thought to have been extinct since Tertiary times, or even earlier. have been found still living in the Atlantic. It seems that more and more "living fossils" are showing up as we look more and more closely. Does anyone want to go looking for a live dinosaur?

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## ARTICLE REVIEW

E. NORBERT SMITH*

"Visual Isolation in Gulls" by Neal Griffith Smith. *Scientific American,* Vol. 217, October, 1967, pp. 94-102.

This article by Dr. Neal Griffith Smith is particularly interesting from a creationist viewpoint,

Dr. Smith presents a discussion of four species of sea gulls (genus *Larus)* that nest together and look very much alike, but use quite subtle cues to avoid interbreeding. The color of the ring or border around their eyes is used in mate selection. According to Dr. Smith:

> In my first season, after observing the behavior of individual pairs of glaucous, Kumlien's and herring gulls in a colony in southern Baffin Island, I captured a small group of the gulls. The eye-ring of each one was changed to the color of a different species. Over the yellow ring of the glaucous gull, *(Larus hyperboreus),* for example, I painted a ring of reddish purple (like that of *L. thayeri).* All the female

*Mr. Smith is a student at Southwestern State College. Weatherford, Oklahoma. His address is 213 N. Caddo Street, Weatherford, Oklahoma 73096.

> birds had copulated with males before the experiment but none had laid eggs. When the females returned to their nest, they were accepted by their mates. In the days that followed, however, the males would no longer mount, in spite of intense solicitation by the females. In all cases where the females eyering color had been changed the pair did not remain together. Five of the males whose mates had been painted formed pairs with nonaltered females in adjacent territories. Copulation ensued, and after two weeks all the new pairs had eggs. The females I had painted left the colony. (p. 97) (Parenthetical additions made.)

This is particularly significant to the creationist. Even casual observation verifies that the vast majority of animals (and plants) tend to breed true or bring "forth abundantly, after their kind." (Gen. 1:21) Dr. Smith has provided additional experimental proof.

It seems the evolutionists have another dilemma: (a) Mutations presumably provide the raw material by which natural selection brought about the "evolution" of these four species of sea gulls. But if the "mutant" looks slightly different, even to merely the wrong eye-ring color, it finds itself incapable of finding a mate at least as far as these gulls are concerned. And without offspring to preserve the possible genetic advantages it possesses, all it lost!

This not only would occur in wrongly colored birds, such as the *Larus* gulls, but in many animals, where breeding involves narrow inflexible stereotyped instinctive behavior. Any slight change in certain mating stimuli (not only color but structural, or behavioral) will decrease fertility, conceivably. How then could any mutant find a mate?

Are we to assume two opposite sexed, physiologically and behaviorally comparable mutants have always chanced to occur in the *same* geographical location at the exact *same* geological time to assure progeny? I think not!

It is more logical to believe that these subtle differences, so effective in maintaining the various species of gulls, are designed by God, who created them for various natural tasks. *(N. B.* Ps. 14:1)

## REPORT OF BOARD OF DIRECTORS MEETING

Annual Meeting of the Board of Directors of the Creation Research Society was held at Ann Arbor, Michigan, April 27 and 28, 1968. Directors present were Henry Morris, Richard Korthals, Thomas Barnes, John Klotz, Paul Zimmerman, Wilbert Rusch, John Moore, Walter Lammerts, Duane Gish, and William Tinkle.

Minutes of the 1967 meeting were read and approved.

Report of the treasurer, Wilbert Rusch, showed a balance of $4,853.30. Since we now have a membership of about 1000, it was evident that we need more office help. Arrangements were made to rent an office at Concordia Junior College and employ an office secretary on a half time basis.

The Committee on Research, chaired by vice-president George Howe, was authorized to send out a financial appeal for the geology project of Clifford Burdick and Harold Slusher.

Chairman Thomas Barnes of the Textbook Commission reported that the book has been written, lacking only some illustrations and references. It is now in the hands of a small committee for final corrections, after which it will be taken to a publisher. It has been the policy from the beginning that all royalties and profits shall go to the Creation Research Society and that no writers shall be paid for their work.

Although agreeing to continue as Editor, Walter Lammerts asked for aid in the editorial work of the Society. George Howe was appointed Assistant Editor of the *Creation Research Society Quarterly* and *Annual.* Due to rising costs, action was approved that beginning July 1, 1968, subscription rates will be $10.00 and membership rates, $7.00, with $1.00 added to each in foreign countries except Canada. Steps were taken to insure that gifts to the Society will be deductible from income taxes.

The following men were nominated for a three-year term on the Board of Directors: Thomas Barnes, Duane Gish, John Grebe, George Howe, John Klotz, Richard Korthals, Walter Lammerts, Karl Linsenmann, Frank Marsh, John Moore, Henry Morris, Wilbert Rusch, Harold Slusher, William Tinkle, Paul Zimmerman, Harold Armstrong, Larry Butler, and Emmett Williams.

Organization of the Board for one year resulted in the following officers: president, Henry Morris; vice-president, George Howe; secretary, William Tinkle; membership secretary, Wilbert Rusch; treasurer, Richard Korthals; publications editor, Walter Lammerts. The present board, however, will continue in office until the election next spring.

Like former sessions, this meeting was marked by full and free discussion followed by unanimous votes to pass motions. Regret was expressed that we do not have funds to pay the traveling expenses of distant members of the Board and it is hoped that friends will help.

Respectfully submitted,
WILLIAM J. TINKLE
Secretary

**Our Society of research scientists representing various fields of successful scientific accomplishment is committed to full belief in the Biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution), both of the universe and the earth with its complexity of living forms.**

**We propose to re-evaluate science from this viewpoint. Beginning in 1964, we are publishing an annual yearbook of articles by various members of the Society and thereafter a quarterly review of scientific literature. Our eventual goal is the realignment of science based on theistic creation concepts and the publication of textbooks for high school and college use.**

1. **The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.**
2. **All basic types of living things, including man, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.**
3. **The great Flood described in Genesis, commonly referred to as the Noachian Flood, was an historic event worldwide in its extent and effect.**
4. **We are an organization of Christian men of science who accept Jesus Christ as our Lord and Saviour. The account of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Saviour for all mankind. Therefore, salvation can come only through accepting Jesus Christ as our Saviour.**

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