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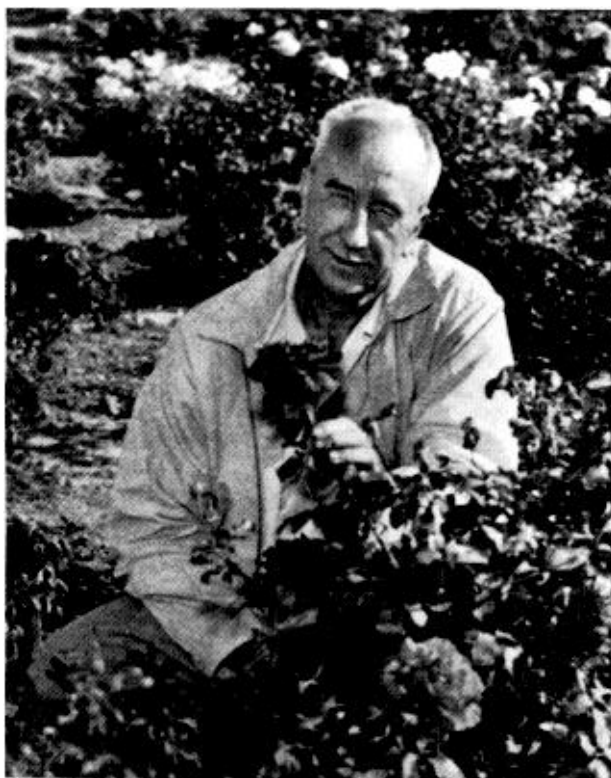
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WALTER E. LAMMERTS

We gratefully dedicate this seventh *Annual* of the Creation Research Society to Dr. Walter E. Lammerts. In addition to being a charter member of C. R. S., Dr. Lammerts served for four years as its first president and five years as publications editor. Present growth of the society and sensible character of its publications are attributable in large measure to the sound judgment and foresight he exercised in the early years of its development.

In 1904, Dr. Lammerts was born in Terre Haute, Indiana. He was four years old when his family moved to Kennewick, Washington, to purchase 10 acres of pear, peach, and apricot land. After discovering that frost frequently killed all the blossoms and fruit, his parents decided to grow asparagus and strawberries. Dr. Lammerts' talents in the area of horticulture were evident when he was still a youngster. He began planting his own private strawberry patch from the discarded plants, and soon became a successful strawberry grower!

His family moved to Southern California in 1918 where he went to high school. He then enrolled in the University of California at Berkeley where he earned his bachelor's degree in entomology (1927) and his Ph.D. degree in genetics (1930).

From 1930 to 1932, he was a fellow of the National Research Council at California Institute of Technology. From 1935 to 1940 he was actively engaged in the breeding and development of roses and peaches for Armstrong Nurseries, Ontario, California, and developed a research program dealing with a wide range of nursery problems. His most successful peach variety, the "Robin" peach, and his famous Charlotte Armstrong rose, among others, were developed at this time.

From 1940 to 1945 he was professor of ornamental horticulture at the University of California at Los Angeles where he began his work with New Zealand Tea Plants and mountain lilacs. In the latter species, he developed "Sierra Blue" and "Mountain Haze."

In 1945 he accepted the position of horticultural consultant for the late Manchester Boddy, publisher of the Los Angeles Daily News. In this capacity, Dr. Lammerts helped to plan the "Descanso Gardens" which now compose a magnificent flower park in the town of La Canada, near Los Angeles. In the park is a rose garden which Dr. Lammerts created, showing the history of the rose with living specimens of species roses and varieties that were developed from the year 1500 to the present.

In 1953 he undertook research and plant breeding for Germain's Inc. in Livermore, California. For his work in rose breeding at Armstrong Nurseries, Ontario, La Canada, and Livermore, he has earned 12 All-American Rose Selection Awards. Four of his most famous prized roses are "Charlotte Armstrong," "Chrysler Imperial," "Queen Elizabeth," and "Bewitched."

Not limiting himself to roses, Dr. Lammerts has originated two famous lilac (*Syringa*) hybrids, Lavender Lady and Sierra Snow, and *Leptospermum* hybrids such as "Ruby Glow." He also developed two thornless varieties of the *Pyracantha* shrub. He has been active in the importation and hybridization of *Camellia* varieties such as the Yunnan *Camellia Reticulata* Hybrids. Dr. Lammerts retired from Germain's in 1964 but still has many rose seedlings in competition and under a selection program for introduction to the public. At present he is breeding for a mildew, rust and blackspot immune rose; a purple flowered mountain lilac; a dwarf *Leptospermum*; and a ground cover edible strawberry.

If the reader will consult *Camellia* yearbooks, rose society annuals, and horticultural publications, he will discover that the foregoing summary of Dr. Lammerts' achievements just begins to scratch the surface. It is understandable why he is known to many in horticultural circles as "The Father of Modern Rose Breeding."

His membership in technical and honorary societies includes many groups such as Phi Beta Kappa, Society of the Sigma Xi, Botanical So-

ciety of America, American Pomological Society, numerous plant breeding societies; and he is listed in American Men of Science. He has authored articles on a variety of subjects and there are at least 50 scientific papers to his credit. He has contributed chapters to several books and has edited others.

Dr. Lammerts married Miriam Schlichting who passed away in 1954. He married Maxine Leininger of St. Paul, Minnesota, in 1957. He has two daughters and three grandsons. Lately, he and his wife Maxine have done considerable traveling to such places as Scandinavia, Berlin, Poland, Russia, Mexico, and the Orient. Presently they are developing a lovely six acre parcel in Corralitos, near Freedom, California.

We honor Dr. Lammerts here because of his bold and tireless stand for such ideas as a young earth, a global flood, and creation "after their kinds" in six days as recorded in the Bible. He has presented solid scientific evidence supporting such a view and is responsible for strengthening the faith of many. His scientific articles favoring rapid, special, divine creation are found in *Annals* and *Quarterlies* of the Creation Research Society as well as in a number of other journals. He is presently active as board member, research editor, and consulting editor for the society.

Dr. Lammerts, for all of this and more, we of the editorial staff and the Board dedicate the 1970 Annual to you with our sincere admiration.

George F. Howe
Editor

EDITORIAL COMMENTS

Contemporary interest focused on the moon, the planets, and the galaxies has led to an outburst of speculation concerning the origin of space and the universe. It is our firm opinion that creationism has better answers to these same problems than does the evolution theory and so we have centered this seventh *Annual* of the Creation Research Society on the general theme of "Space." The papers revolve around the four major fields of *stellar origins, life, thermodynamics, and dating*.

Professor George Mulfinger and Harold W. Clark each present treatises dealing with the *origin of the stars and the earth*. Professor Mulfinger's paper will undoubtedly provide a sound basis for creationist astronomy in years ahead and it should be a great stimulus to others interested in astronomy and scripture. From sophisticated mathematics, Professor Mulfinger demonstrates the physical absurdity of evolutionary theories which require condensation of matter in ages past. He points to evidence which should

devastate the idea of stellar evolution.

In a helpful paper on cosmogony, Professor Clark clearly and adequately shows that all theories dealing with the origin of the universe are purely speculative. He points to several facts which support a recent date for the creation of the earth.

Two authors have studied the likelihood of existence of *life on other worlds*. Both Professor Frank W. Cousins and Professor Harold Armstrong conclude that there is no firm support to believe in life anywhere else than on earth. These two papers should do much to dispell the vague and hypothetical reasoning of scientists and laymen on this matter. Readers who have puzzled over "unidentified flying objects" will also discover pertinent comments on that topic by Professor Armstrong.

Allied to the question of possible life on other worlds is the conundrum of how life arose here on earth. Dr. Duane Gish attacks this question by reviewing recent geochemical studies and

pointing to several unsolved problems facing those who defend naturalistic explanations in his splendid work entitled, "The Nature of Speculations Concerning the Origin of Life."

Our third major emphasis is the domain of *thermodynamics*. In his paper, "Is the Universe a Thermodynamic System?", Dr. Emmett Williams, Jr. has plainly distinguished between facts and current fancies regarding characteristics of our universe. Dr. Williams reveals the unbridled and fruitless theorizing of evolutionists. Previous papers by Dr. Williams have elicited comments by Dr. Walter Lammerts and Mr. David A. Shetland which are included here.

A valuable paper on "Origin and Development of the Universe" by Dr. Thomas G. Barnes shows that the laws of thermodynamics have a better degree of fit with creationism than with evolutionism.

Our fourth topic is that of *dating* and we present two fine challenges to the "long ages" concept in excellent papers by Dr. Melvin A. Cook and Professor Robert L. Whitelaw. As in earlier articles, Dr. Cook continues effectively to criticize basic assumptions by Dr. Willard F. Libby concerning the "Carbon-14 Clock." Professor Whitelaw affords the reader a broad view of the many startling C-14 dates which have undermined previous long-age estimates for many materials such as coal, oil, natural gas, and certain fossil skulls. Apparently the C-14 method is a "two-edged sword" which has become "too hot to handle" for evolutionists. Professor Whitelaw provides appropriate corrections for many C-14 dates, and then demonstrates

their use to support a Bible-based chronology.

This issue contains other unique features such as an introduction to Bryan College, a delightful treatise on the Gecko by Dr. Willard L. Henning, continued helpful creationist notes on current literature by Professor Armstrong, and some interesting comments on buried redwoods by Mr. V. L. Westberg.

Serving as Editor is an easy task because faithful authors have contributed these outstanding materials to this "Space" issue. I am also deeply grateful to the members of the Board and the Editorial Committee who have helped to improve these papers by their detailed suggestions and unstinting editorial assistance. Finally, it is always true (but seldom stated) that this issue (and *Quarterly* issues) would never have appeared in print without the careful management of Dr. John N. Moore. Dr. Moore receives a set of typed manuscripts and from these (by many steps and much labor) guides preparation of the finished product which lies in your hands.

In conclusion, if there is certain evidence in nature for "variation," there is more evidence for "fixity." If there is some support for "continuity," there is massive indication of "discontinuity." If some workers adhere to a "Neo-Darwinianism" and others defend a "Neo-Lamarckianism," the truth demands that some uphold a "Neo-Linnaeanism." In studies about origins there is a great gaping void in all empirical work which can be filled only if God is understood as a Reality and the Book of Genesis as inerrant.

George F. Howe
Editor

COMMENTS FROM PRESIDENT MORRIS

For of Him and through Him, and to Him, are all things: to whom be glory for ever. Amen. (Romans 11:36)

The theme of this Annual Issue, marking the beginning of our seventh year of publication, stresses cosmology, the grand study of "all things," in heaven, and in earth. Nearly infinite absurdity is implied in the conceptual origin of a nearly infinitely-complex cosmos by random processes,—and yet such is the faith of modern scientism! "When they knew God, they glorified Him not as God, neither were thankful; but became vain in their imaginations, and their foolish heart was darkened. Professing themselves to be wise, they became fools." (Romans 21:22)

Despite the "vain imaginations" of modern evolutionary cosmologists, "the invisible things of Him from the creation of the world are clearly seen." (Romans 1:20) As shown in the articles to follow, an abundance of evidence exists against an evolutionary cosmogony and in support of

special creation, from the cosmologic sciences of astronomy, thermodynamics, biochemistry and nuclear physics.

In the lead article, George Mulfinger has devastatingly unveiled the bankruptcy of evolutionary astronomy. The clearest and most accurate statement of stellar origins is still found in Psalm 33:6: "By the word of the Lord were the heavens made, and all the host of them by the breath of his mouth."

Harold Armstrong, in addition to an excellent article on the improbability of corporeal living beings on other planets, in his regular column continues to exhibit an amazingly wide-ranging, yet always incisive, commentary on current developments in science as related to Biblical creationism. He makes a number of especially intriguing comments and suggestions concerning the "canopy theory," as inferred from those Scriptures dealing with antediluvian cosmology.

In that connection, it is interesting to note an

unresolved conflict between the two outstanding discussions on radiocarbon dating in this Annual Issue by Dr. Melvin Cook and my friend and colleague, Professor Robert Whitelaw. Both men effectively point out the important fallacy in the assumption of world-wide equilibrium between radiocarbon formation and decay. However, Cook suggests that all radiocarbon dates be corrected to a post-diluvian time-scale, whereas Whitelaw corrects them to a time-scale beginning with the Genesis creation and notes that the statistical array of radiocarbon dates indicates a decided decrease in living matter at a corrected time corresponding to the Noahic deluge.

A pre-diluvian canopy of water, such as discussed by Armstrong and by many other writers during the past century, would have seriously inhibited the formation of radiocarbon before the Flood and would also, when torrentially precipitated at the Flood, have drastically altered the worldwide carbon balances, so that, as Cook says, "the 'beginning' of radiocarbon in the atmosphere seems not to be at the beginning of the earth, but rather in the flood, perhaps only about 4500 years ago."

Another question is raised by the fact that practically all of the 15,000 radiocarbon datings analyzed by Whitelaw have been made on organic materials which are dated stratigraphically as Pleistocene or Recent, which would imply post-diluvian formation. The absence of radiocarbon-dated materials in pre-Pleistocene strata poses a problem if radiocarbon actually dates materials existing since the creation. On the other hand, Whitelaw's study raises the serious question whether more radiocarbon dates might not be obtained on Paleozoic and Mesozoic materials if it were not automatically assumed that such would necessarily give infinite radiocarbon ages! This should make an interesting research project.

If all radiocarbon dates should actually be post-diluvian, as implied by the canopy theory

and by the cataclysmic changes in the earth's lithosphere and atmosphere at the Flood, then the sharp decline in numbers of radioactive datings noted by Whitelaw at a time attributed by him to the Flood must be explained in some alternate way. There is no doubt that his data are statistically significant and strongly suggestive of some kind of global change in the biosphere. Possibly the limited number of datings from this period could indicate, not necessarily a reduction in the biomass itself, but rather an inhibition of conditions favoring preservation of organic materials in form suitable for radiocarbon measurements. In any case, his array of data is most fascinating and impressive, and warrants much further study.

Space does not allow comment on the other papers presented, though all are important contributions to a truly Biblical cosmology. Instead, let me close with a brief outline of some Christological implications of cosmology. As we continue to develop our research in scientific creationism, we must never forget that the great Creator is none other than the Lord Jesus Christ, who has also become our Saviour! Note again the cosmology, indeed the theology-of "all things:"

(1) "For by (Christ) were all things created, that are in heaven, and that are in earth." (Colossians 1: 16)

(2) "And by Him all things consist" (that is, literally, "are sustained," or "conserved"). (Colossians 1:17).

(3) "And, having made peace through the blood of His cross, by Him to reconcile all things unto Himself . . . whether they be things in earth, or things in heaven." (Colossians 1:20)

Since He is thus the Creator, Sustainer and Redeemer of "all things" in the whole cosmos, it follows rigidly that "In Him are hid all the treasures of wisdom and knowledge." (Colossians 2:3) To comprehend cosmology as it really is, therefore, it is essential to see it in Christian perspective, "for it pleased the Father that in Him should all fulness dwell." (Colossians 1: 19)

NEW BOOK ANNOUNCEMENT

BIOLOGY: A Search for Order in Complexity

A High School Biology Textbook prepared by the Textbook Committee, Creation Research Society. Zondervan Publishing House, Grand Rapids, Michigan 49506.

John N. Moore and Harold Slusher, Editors.

Both evolutionists and creationists agree as to the actual facts of biology but the interpretation of those facts in relation to the question of origins depends upon the philosophic preference of the individual biologist. Today a significant

body of biologists and other scientists are convinced that special creation provides a more reasonable and satisfying philosophy of origins than evolution. This textbook will serve to effectively teach the actual facts of biologic science and will also acknowledge the creation concept as the most acceptable underlying explanation of these facts. Written by qualified specialists, this book is both readable and teachable, as well as factually accurate and comprehensive. Over 200 illustrations. 640 pages. (October, 1970). \$7.95

CRITIQUE OF STELLAR EVOLUTION

GEORGE MULFINGER*

The theory that stars condense spontaneously from interstellar clouds is challenged from several standpoints. Entropy and force calculations are presented, the results of which indicate that such a process would be contrary to the workings of nature. The circular reasoning inherent in astronomical dating methods is discussed, along with a sampling of the many age discrepancies in the literature today. The conclusion from this study is that such dating methods are entirely devoid of scientific value, since they involve guessing at an evolutionary history for the object being dated. Other topics discussed include the alleged serial relationships among stars and problems of planet and galaxy formation.

Today the following doctrines are taught almost universally as fact:

1. All astronomical bodies have condensed from clouds of primordial material such as hydrogen. (When this is considered in conjunction with alleged biological evolution processes, then plants, animals, and people are held to be nothing more or less than descendants of mere hydrogen gas.)

2. Such "creative" processes have been proceeding for billions of years and are still continuing today.

3. These processes are totally spontaneous and self-ordering, ruling out any need for a Creator.

4. Various types of stars such as red giants and white dwarfs are serially related, much as the larva, pupa, and adult stages of insect metamorphosis. One type is said to merge or evolve into another over millions or billions of years. The Creator is thus denied the prerogative of structuring variety or diversity into the original universe. Each star, it is claimed, started as an undifferentiated cloud and has passed inexorably through the prescribed stages.

Little spiritual perception is needed to appreciate that there is something amiss with the theory that human beings have evolved out of hydrogen gas by natural processes. Yet this is only one of the many problems, both scientific and scriptural, that must be reckoned with if the basic framework of stellar evolution is accepted. A number of these problems will be discussed in the course of this paper.

Let us be aware of what is solid experimental evidence on the one hand, and what has been supplied by human imagination on the other. May we have the wisdom to remain firmly grounded on that which is true science.

Observation Lacking

Needless to say, no one has ever watched a star traversing its "life cycle" from "birth" to "death." In fact Abell has likened our most ex-

tensive observations on an individual star to observing the aging process in a man, by studying him for only ten seconds out of his lifespan of threescore and ten.¹ The other 69 years, 364 days, 23 hours, 59 minutes, and 50 seconds would have to be inferred by guesswork.

Stuart Inglis, in his *Planets, Stars, and Galaxies*, readily admits, ". . . for any single star we cannot yet tell accurately its age, its past, and its future existence." "In all the heavens there is no star concerning which astronomers have detailed knowledge. Yet when they generalize about *all stars*, they appear quite certain. This is most difficult to understand. Even if far more were known, it would still behoove scientists to maintain an attitude of humility and caution. Not only are we restricted to *present* observations; we are severely limited by the fact that we can only study stars "skin deep" (we see only their surface), and we are forced to view them through interstellar material whose nature and quantity are only poorly understood.

Circular Reasoning

To one who delves into this realm in any depth, it soon becomes apparent that astronomers are guilty of the same type of circular reasoning that is practiced by geologists and paleontologists. Stellar evolution is assumed in making the age estimates of stars. But then the age estimates are used to establish a framework for stellar evolution. The following discourse might serve to make this more concrete:

Instructor: "Aldebaran, in the constellation Taurus, is considerably older than our sun."

Student: "How do we know that?"

Instructor: "It has obviously evolved past the Main Sequence up into the red giant region of the Hertzsprung-Russell diagram (See next section) whereas the sun is still *on* the Main Sequence. There is another category of stellar objects called the T Tauri stars that are *younger* than our sun, not having yet evolved *to* the Main Sequence."

Student: "But how do astronomers know that stellar evolution takes place at all?"

Instructor: "Because we find stars of various ages that testify to it. These are snapshots, as it

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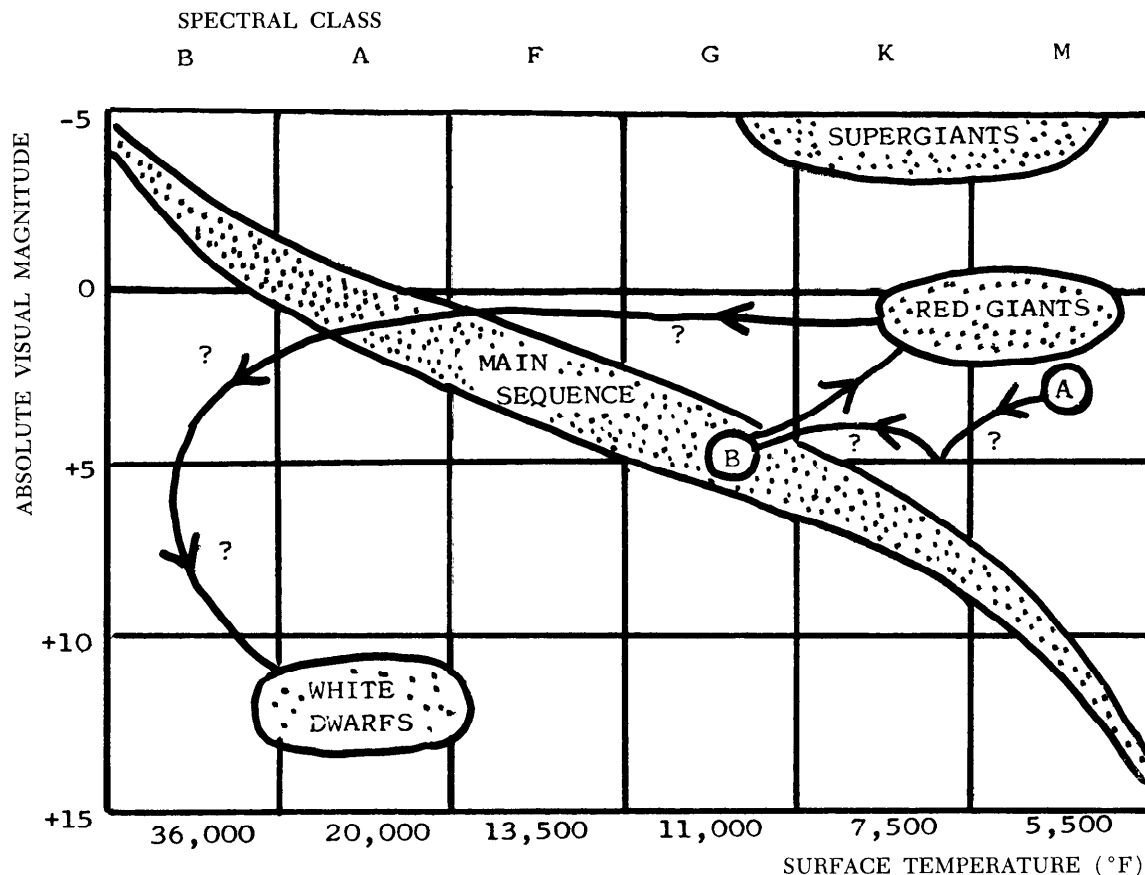


Figure 1. Hertzsprung-Russell Diagram for stars in the spiral arms of our galaxy, showing hypothetical "evolutionary track" for the sun. The track starts with the alleged condensation from interstellar material at "A" and goes through the sun's present position at "B". Eventually, it is claimed, the sun will evolve into a red giant, and finally a white dwarf.

were, of different stages of the process. From these we are able to piece together a logical evolutionary sequence."

Christian students of biology or geology will be only too familiar with this kind of reasoning. Evolution is assumed in establishing the "ages;" then the "ages" are used to establish evolution. Astronomers use the stars instead of the index fossils of biological evolution. Whenever a certain type of star is found, a certain history is automatically demanded. The alternative of direct creation with diversity is not even considered.

The Hertzsprung-Russell Diagram

For the stars in the spiral arms of our galaxy, if one makes a plot of the actual intrinsic brightness (absolute magnitude) versus temperature, then results similar to Figure 1 will be obtained. For most stars there is a clear-cut correlation: the hotter the star the greater its brightness. The majority of stars fall along a diagonal extending

from the upper left to the lower right, called the Main Sequence. Our sun, a typical Main Sequence star, is located at "B." Other important categories are the red giants, the supergiants, and the white dwarfs.

The Hertzsprung-Russell (H-R) diagram has long served as a useful descriptive representation for stars in our galaxy. However, in recent years its use has been turned largely to tracing "evolutionary tracks." One such track is included in Figure 1. It purports to trace the life history of our sun from the time of its condensation from interstellar material at "A" to its final demise in the white dwarf "stage" at the lower part of the diagram.

Presumably the Main Sequence consists of stars whose chief energy-producing reaction is the fusion of hydrogen to form helium. The red giants are said to be stars in which all hydrogen has been consumed and only helium fusion occurs.

There are, interestingly enough, more “missing links” than stars along the “evolutionary tracks.” This important fact will be discussed in a subsequent section.

The alleged directions of such tracks have been drastically altered in recent years. At one time many astronomers had envisioned evolution down the Main Sequence from left to right. Now the tracks are often at right angles to the Main Sequence. Projecting ahead into the future, we may expect many more changes, as the theories are further adjusted to conform to the whims of the times.

No star has ever been followed through such an evolutionary path observationally. Minor shifts in position on the H-R diagram *have* been observed. Cepheid variables, for example, oscillate both in brightness and in temperature. Novae and supernovae brighten up explosively, moving them upward temporarily on the H-R diagram. But never has one type of star been observed to merge or evolve into another type.

Stellar Aging

Every star is a dynamic system undergoing degenerative changes. The “normal” degenerative processes such as fuel consumption do not produce perceptible changes on the H-R diagram during the length of time that we have been observing stars telescopically. Since only the outermost parts of a star can be observed, it is necessary to guess at the interior composition.

The theoretician therefore devises a *model* that is based on various simplifying assumptions. It is this model that is dealt with so imaginatively in projecting evolutionary processes forward or backward on a time scale that is extended many orders of magnitude beyond what is warranted by the data at hand.

Actually, we do not even vaguely comprehend the makeup of the present universe, let alone what it once was, or what it is destined to become. To extrapolate into billions of years on the basis of a few decades of observations is sheer folly. But scant as these observations may be, they should be faithfully adhered to in erecting the superstructure of the science of astronomy, rather than merely using them as a point of departure for speculation.

Concerning the terminology that is applied to changes in stars it would be far more accurate to use the term “stellar aging” rather than “stellar evolution.” The latter implies that there is some kind of upgrading or improvement involved. In all the studies that have been made to date, *only downhill processes* have actually been found to occur: disruption, dissipation, and disintegration. These include:

1. Consumption of hydrogen, a high-energy content fuel, leaving as “ashes” low energy fuels such as helium. The sun, a typical star, consumes four and one half million tons of fuel per second.
2. Radiation of electromagnetic energy and neutrinos into space in all directions, with no possible means of recovery.
3. Loss of material by violent disruptive events, as in novae and supernovae. (It is also suspected that planetary nebulae are formed by catastrophic eruptions in stars.)
4. Spinning off of material to form an expanding stellar atmosphere, as in shell stars.
5. Ejection of energetic particles from a star’s surface by mechanisms such as solar flares.

Star Formation

As spontaneous generation is supposed to precede biological evolution, so star formation is said to precede stellar evolution. Herein lies one of the knottiest problems of all. One unusually frank astronomer states:

Contemporary opinion on star formation holds that objects called protostars are formed as condensations from interstellar gas. This condensation process is very difficult theoretically, and no essential theoretical understanding can be claimed; in fact, some theoretical evidence argues strongly against the possibility of star formation. However, we know that stars exist, and we must do our best to account for them.³

The last sentence is not without humor. Stars are “there,” presenting a challenge to the cosmic evolutionist, in the same sense that Mr. Everest was “there” as a challenge to Hillary. But why is it that there *are* things which exist that the evolutionist feels no need to account for—such as the primeval hydrogen and the law of gravitation? These things and many others are simply taken for granted.

Another very revealing statement, admitting that star formation seems so improbable that it should never happen, comes from none other than G. R. Burbidge, a recognized authority on the “evolution of elements” in stars: “If stars did not exist, it would be easy to prove that this is what we expect.”⁴ The problem, simply, is that the condensation of a star from interstellar material would violate a good deal of what we know about the laws and processes of nature.

Practically all of the popular paperbacks, and 100% of the many textbooks that I have acquired, gloss over this problem most superficially. Implicit faith is expressed in the theory that stars condense spontaneously from interstellar clouds by gravitational attraction. As both cause

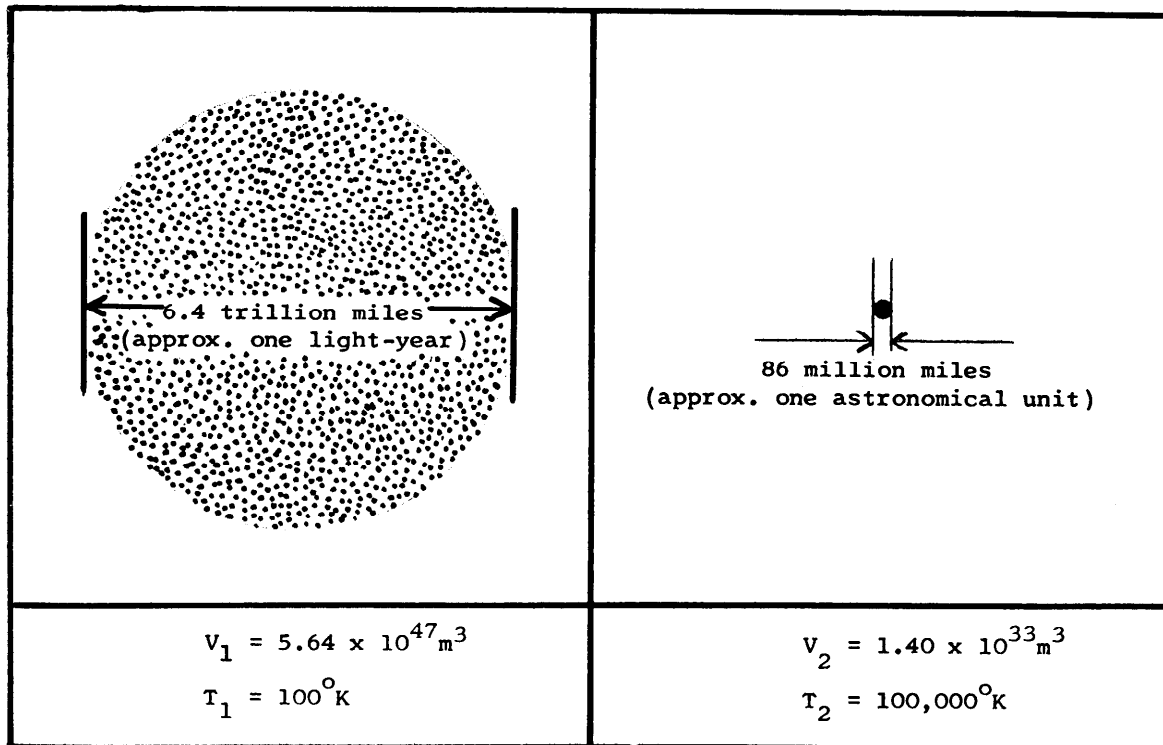


Figure 2. "Before" and "After" sketch of hypothetical condensation to form star. (not draw to scale)

and effect seem to be present, it "makes sense" to the average reader. He readily accepts the idea and reads on to the next speculation. However, precise computations with available data indicate that the alleged process would fail completely.

Calculating with figures given by cosmogonists, we can estimate the entropy change for such a hypothetical condensation. If it turns out that the entropy *increases* in such a process, we must conclude that it is natural and in keeping with the "downhill" trend of nature. If, however, we find that the entropy would have to *decrease*, we have every right to be suspicious; "uphill" processes require organizing intelligence and/or energy from the outside. We would then have to examine whether such could be supplied within the scope of natural occurrences.

I will use for my calculations values suggested by Lyman Spitzer of Princeton in a paper presented at the Goddard Institute for Space Studies in New York.⁵ Let us consider an interstellar cloud massive enough to form the sun, 2×10^{30} kilograms. Spitzer gives, as the temperature of the cloud, 100° Kelvin.⁶ From a relationship that he gives, its volume can be readily determined, to be 5.64×10^{47} cubic meters.⁷

By the time the radius of the cloud has supposedly shrunk to 100 times the sun's radius (stellar dimensions), its mean temperature is presumed to have risen to $100,000^\circ$ Kelvin.⁸ The volume at this stage is calculated to be 1.40×10^{33} cubic meters.⁹ (See Figure 2)

We see that the volume has been reduced by a factor of 400 trillion (the diameter going from about one light-year down to about one astronomical unit) while the temperature has been increased by a factor of only 1000. We might guess already that the entropy would have to decrease in such a process.

Calculation of Entropy Change

Treating the system as an ideal gas (which is an excellent approximation because the material is so spread out) the entropy change may be computed by a well-known relationship found in any standard thermodynamics text:¹⁰

$$dS = C_p \frac{dT}{T} + R \frac{dV}{V} \quad (1)$$

where S is the entropy; T , the absolute temperature; V , the volume; C_p , the molar heat capacity at constant pressure; and R is the universal gas constant. Integrating both sides, we obtain

$\Delta S = C_p \ln T_2 - C_p \ln T_1 + R \ln V_2 - R \ln V_1^*$ (2)
Substituting the values previously discussed for V_1 , V_2 , T_1 , and T_2 , and utilizing the ideal gas value of $(5/2)R^{**}$ for C_p , we obtain

$$\Delta S = 5/2 R \ln T_2 - 5/2 R \ln T_1 + R \ln V_2 - R \ln V_1$$

Now, as mentioned above, we will call T_2 the temperature existing when the radius has shrunk to 100 times the sun's radius and its value is $100,000^\circ$ or 10^5 degrees while T_1 was 100° or 10^2 degrees presumed for the interstellar cloud. The volume V_2 , when shrunk, is 1.40×10^{33} cubic meters as compared to the original volume V_1 of 5.64×10^{47} cubic meters. By substitution of these values, we obtain

$$\Delta S = (5/2) R \ln 10^5 - (5/2) R \ln 10^2 + R \ln 1.4 \times 10^{33} - R \ln 5.64 \times 10^{47}$$

Temperature and volume units are dropped because a logarithm is an exponent and as such has no units. To simplify this equation we may substitute the value of 2 cal/mole $^\circ$ K for R and arrive at the following equation:

$$\Delta S = 51n10^5 - 51n10^2 + 2ln1.40 \times 10^{33} - 2ln5.64 \times 10^{47}$$

We change to common logarithms or "log₁₀" by multiplying each natural logarithm by 2.3. This changes the base from the natural log base "e" to base 10:

$$\Delta S = (5)(2.3)\log 10^5 - (5)(2.3)\log 10^2 + (2)(2.3 \log 1.40 \times 10^{33}) - (2)(2.3 \log 5.64 \times 10^{47})$$

$$\Delta S = (5)(2.3)(5) - (5)(2.3)(2) + (2)(2.3)(33.146) - (2)(2.3)(47.751)$$

$$\Delta S = 57.5 - 23.0 + 152 - 220$$

$$\Delta S = -33 \text{ eu/mole}$$

The entropy must decrease 33 entropy units for every mole of material in the cloud! The

*The integral of dT/T equals the natural logarithm of T plus a constant. To evaluate this as a definite integral between the temperatures T_1 and T_2 we substitute T_2 into the expression $(\ln T + C)$ and from this subtract the expression with T_1 substituted into it. Thus

$$(\ln T_2 + C) - (\ln T_1 + C)$$

The constants cancel and we have
 $\ln T_2 - \ln T_1$

Since originally dT/T was multiplied by C_p , our result is multiplied by C_p :

$$C_p (\ln T_2 - \ln T_1), \text{ or } C_p \ln T_2 - C_p \ln T_1$$

The same reasoning holds for transforming RdV/V into $R \ln V_2 - R \ln V_1$.

** C_p is the molar heat capacity of a gas at constant pressure. The cosmogonists generally assume that such a cloud contracts under a constant external pressure, and that the gas is neutral atomic hydrogen. (See Reference #12) Hydrogen in this form is a good approximation to an ideal monatomic gas, whose C_p is $(5/2)R$.

fact that the derived result is negative indicates clearly that the condensation is not a spontaneous process. The temperature term makes a positive contribution, but this is more than offset by the large negative contribution of the volume term.¹¹

As our scientific intuition might have told us, it is more natural for the cloud to expand than to contract, since we know from laboratory observations that gases expand spontaneously but do not contract spontaneously. Anyone who has ever pumped up a tire by hand and thus concentrated a given amount of air into a smaller volume realizes how much energy goes into such an operation.

Applying the second law to the star formation process, then, we find that the reverse process rather than the forward process is favored. Here is just one more instance where the second law of thermodynamics points to creationism as the only realistic explanation for the origin of the universe we live in.

Calculation of Outward Push

We will also calculate the forces acting at the surface of the original cloud. It can be shown thereby that the outward push due to thermal motion of the molecules, even at 100° Kelvin, is greater than the gravitational pull inward.

The outward push of the cloud can be calculated starting from the ideal gas law

$$PV = nRT \quad (3)$$

where P is the pressure, V is the volume of the cloud, n is the total number of moles of material in the cloud, R is the universal gas constant, and T is the absolute temperature. Again, this is an excellent approximation because the individual particles are so far apart. Solving for pressure,

$$P = \frac{nRT}{V}$$

The total force outward over the whole surface of the cloud is simply this quantity times the surface area of the cloud.

$$F = PA = \frac{nRTA}{V} \quad (4)$$

Assuming a spherical cloud, as is customary in the literature, its area and volume would be $4\pi r^2$ and $4\pi r^3/3$ respectively. We have, therefore,

$$F = \frac{nRT (4\pi r^2)}{4\pi r^3/3} \quad (5)$$

By cancellation of $4\pi r^2$ from numerator and denominator and multiplying each by 3, we find that

$$F = \frac{3nRT}{r} \quad (6)$$

where r is the radius of the cloud. The numerical value of the radius is 5.13×10^{15} meters (about 3.2 trillion miles). Assuming the material to be neutral atomic hydrogen,¹²

$$F = 3 \left(\frac{2 \times 10^{33} \text{ grams}}{1 \text{ gram/mole}} \right) \left(8.31 \frac{\text{joules}}{\text{mole } ^\circ\text{K}} \right) \left(100^\circ\text{K} \right) \\ \frac{5.13 \times 10^{15} \text{ meters}}{5.13 \times 10^{15} \text{ meters}} \\ F = 9.72 \times 10^{20} \text{ newtons}$$

The *outward* push due to thermal motion of the molecules is found to be 9.72×10^{20} newtons.

We shall now compute the *gravitational pull inward* for the whole cloud by the hydrostatic equilibrium relationship:¹³

$$\frac{dP}{dr} = \frac{\rho GM(r)}{r^2} \quad (7)$$

where r is the radius of the cloud, P is the pressure, ρ (rho) is the density, and $M(r)$ is the mass of the whole cloud expressed as a function of r . Assuming uniform density, $M(r)$ may be replaced by density times volume or $(\rho) \left(\frac{4}{3}\pi r^3 \right)$ giving

$$\frac{dP}{dr} = \frac{\frac{4}{3}\pi \rho^2 Gr^3}{r^2} = \frac{4}{3}\pi \rho^2 Gr \quad (8)$$

Writing this in differential form,

$$dP = \frac{4}{3}\pi \rho^2 Gr dr$$

Integrating from the center of the cloud to the edge,

$$\int dP = \int_0^r \frac{4}{3}\pi \rho^2 Gr dr \\ P = \frac{2}{3}\pi \rho^2 Gr^2 \quad (9)$$

The total force inward at the surface is this quantity times the area of the surface, which, as before, is $4\pi r^2$:

$$F = PA = \left(\frac{2}{3}\pi \rho^2 Gr^2 \right) (4\pi r^2) \quad (10)$$

which simplifies to

$$F = \frac{8}{3}\pi \rho^2 Gr^4 \quad (11)$$

When we substitute $M/\frac{4}{3}\pi r^3$ for ρ , the expression reduces to

$$F = \frac{3GM^2}{2r^2} \quad (12)$$

Substituting MKS values,

$$F = \frac{(3)(6.67 \times 10^{-11})(2 \times 10^{30})^2}{(2)(5.13 \times 10^{15})^2} \\ F = 1.52 \times 10^{19} \text{ newtons}$$

The inward pull at the surface of the cloud due to gravitational attraction is found to be 1.52×10^{19} newtons.

Let us now compare the outward and inward forces at the surface of the cloud:

$$\frac{F_{\text{outward}}}{F_{\text{inward}}} = \frac{9.72 \times 10^{20}}{1.52 \times 10^{19}} = 64$$

The cloud has 64 times as much outward force as inward; it therefore has a greater tendency to expand than to contract. Let us keep in mind that we allowed a leading cosmogonist to choose the initial conditions for the cloud. We gave him the advantage of choosing his starting materials and circumstances, but the results of the calculations are *still* seen to militate strongly against star formation.

When we apply the same equations to the condensed material (the material at V_2 and T_2 having a radius slightly less than the radius of the earth's orbit) we see that here gravitation is in fact causing the material to contract.¹⁴ But how it was reduced to that volume in the first place is impossible to understand, short of direct creation.

From equations (6) and (12) used above it can readily be seen that an object which already possesses stellar dimensions will exhibit a strong gravitational pull inward, easily overcoming the thermal push outward.¹⁵

$$F = \frac{3nRT}{r} \quad (\text{thermal push outward})$$

$$F = \frac{3GM^2}{2r^2} \quad (\text{gravitational pull inward})$$

The outward force is inversely proportional to the radius, while the inward force is inversely proportional to the radius *squared*.

In general, therefore, the smaller the object the more successfully it can contract, provided equilibrium has not yet been reached. But the enormous clouds that are fashionable among theoreticians today (those that are supposed to produce stars in groups of hundreds of thousands) are extremely unfavorable for contraction. *Gravitation avails little at such a radius.*

More Speculation Introduced

How, then, do they propose to make the star formation process "work?" With the second law of thermodynamics working against them, and gravitation failing to overcome the thermal force outward, are they not ready to concede defeat? Never!

Some fertile mind can always concoct a scheme to get around the laws of nature—at least on paper. The scheme that is invoked here is simply this: surround the cloud you wish to compress with a *hotter* cloud, so that the molecules at the surface of the inner cloud will be bombarded by the faster moving molecules of the outer cloud and pushed inward. By stacking the deck in this manner, enough brute force can allegedly be mustered to render the impossible possible.

As Spitzer describes it, the 100°K cloud we wish to compress must be surrounded by a second cloud having a temperature of 10,000°K, the inner cloud being neutral hydrogen, the outer, ionized hydrogen (HI and HII regions, respectively, in astronomical parlance)¹⁶. Unfortunately for the theory, however, it is questionable whether HI regions occur in such pockets surrounded by HII regions.

The realistic situation appears to be just the opposite. According to Bart Bok, HII regions are generated by very hot O or B class stars*, and expand against the surrounding HI region.¹⁷ But in order to make the above-mentioned scheme work, an HI region would have to be providentially enclosed within an HII region, over 4π steradians of solid angle, *contrary to observation*.

By rigging the starting conditions in this manner Spitzer leaps over a number of problems without ever facing them. The inner cloud, being 100 times cooler than the outer, is already much more condensed than its surroundings at the very outset. How did it get that way?

The 10,000°K that Spitzer postulates for the outer cloud is more than half again as hot as the sun's surface. How could an extended region of interstellar material attain such a temperature? Heating by nearby stars? How, then, did the first stars condense before there were other stars present to heat up the gas? It is reminiscent of the chicken-versus-egg dilemma encountered in Whipple's Dust Cloud Hypothesis, discussed in an earlier paper.¹⁸ In that instance, light pressure from other stars was imagined to concentrate the material into a smaller volume.

Perhaps the most ludicrous part of the whole hypothesis is the cosmogonists' naive faith that the hot and cold clouds will remain unmixed over many millions of years (Herbig gives a figure of 50 million years!) while the condensation process is in progress! But an avid pantheist

credits "Nature" with many great and mighty powers, including the ability to violate its own laws.

Other Star Formation Difficulties

Turning now to other types of difficulties connected with star formation, we note that there is a serious angular momentum problem. The original cloud would be rotating slightly, due to differential galactic rotation (a surface velocity of about 100 meters per second.)¹⁹ If the cloud were to contract to a star with strict conservation of angular momentum, the surface velocity of the star would be greater than the speed of light!²⁰ Thus the cosmogonist finds himself embarrassed by too much angular momentum and he is forced to imagine mechanisms for disposing of the excess. So far, the schemes that have been proposed have been notably lacking in credibility.

Still another big question mark concerns the strength and topography of the magnetic field throughout the galaxy. If the field intensity is as high as 2×10^{-5} gauss, star formation will be "in difficulty."²¹ One widely held view is that the field is parallel to the spiral arms of the galaxy, and is indeed as strong as 2×10^{-5} gauss.

However, whenever a question exists due to lack of experimental evidence, the cosmogonists have a habit of giving themselves the benefit of that doubt.

All in all, Spitzer does not seem completely sold on the scheme that he outlines. This is evidenced by statements such as the following: "It should be emphasized that all this discussion is quite tentative and serves principally to point out some of the problems involved."²² After listing the hypothetical stages in star formation he states, "As one indication of the many uncertainties in star formation theory, it should be noted that possibly some of these stages do not even arise during the actual process of star birth."²³ Thus the man, who is probably the leading authority on the subject, appears to have numerous reservations concerning the details of the process. Yet faith abounds that the process does in fact take place, and that it is a common everyday phenomenon throughout space and time.

Journalists are always anxious to produce sensationalistic copy bearing a headline such as "A Star is Born," or "Birth of Star Appears Imminent." A UPI release of October 2, 1967 declared that mankind may be treated to the grand spectacle of the birth of a star within the next 20 years. Based on a somewhat misquoted *Scientific American* article by George Herbig, the release stated that the Orion Nebula (Figure 3) is being watched closely in hopes that the "gestation period" of some "protostar" will soon be completed.

*Stars are classified according to their spectra into seven major divisions: O, B, A, F, G, K, and M. The class O and B are bluish-white stars possessing unusually high surface temperatures—greater than 25,000°K for the class O, and 11,000-25,000 for the class B. (This is considerably hotter than the sun which has a surface temperature of about 6,000°K.)



Figure 3. Great Nebula in Orion (M42). Astronomers are watching this nebula closely in hopes of seeing “the birth of a star” in the next few years. However, even if such a process were theoretically possible, such an event could never be definitely verified. If a “new” star is seen, it could simply be due to the thinning of interstellar dust in front of a star that was already there.

There is one serious problem concerning observational verification when studying such a nebula. If a “new” star is seen, it could simply be due to the thinning of interstellar dust in front of a star that was already there. This fact has been soberly admitted in the literature but has yet to find its way into the news media.

Scripture seems clear on the fact that the heavens were fully structured at the end of the Creation week. Genesis 2:1 declares “Thus the heavens and the earth were finished, and *all the host of them*.” The 33rd Psalm also conveys the impression of a divine fiat that brought the stars suddenly into existence: “By the word of the Lord were the heavens made; and all the host of them by the breath of His mouth. . . For He spake, and it was done; He commanded, and it stood fast.” (Psa. 33:6, 9) Again, in Exodus 20:11 we read, “For in six days the Lord made heaven and earth, the sea, and *all that in them* is, and rested the seventh day. . .”

Galaxy Formation

From the foregoing discussion it will be appreciated that condensations of “primordial material” are most problematical. On the galactic level, however, the difficulties are present on a far grander scale. In the case of our own galaxy, at least, one must explain the intricate makeup of the disc—its nucleus and spiral arms containing some 100 billion stars, the hundred or so globular clusters (each containing several tens of thousands of stars) that revolve around the galaxy as satellites, and the galactic corona. (See Figure 4)

Many cosmogonists have been unwilling to tackle the question of galactic origins. Alfvén displays a healthy respect for the problem admitting readily that our “knowledge” of star formation does not appreciably enhance our understanding of galaxy formation:

But even this approach to an explanation eventually leads us into serious difficulties.

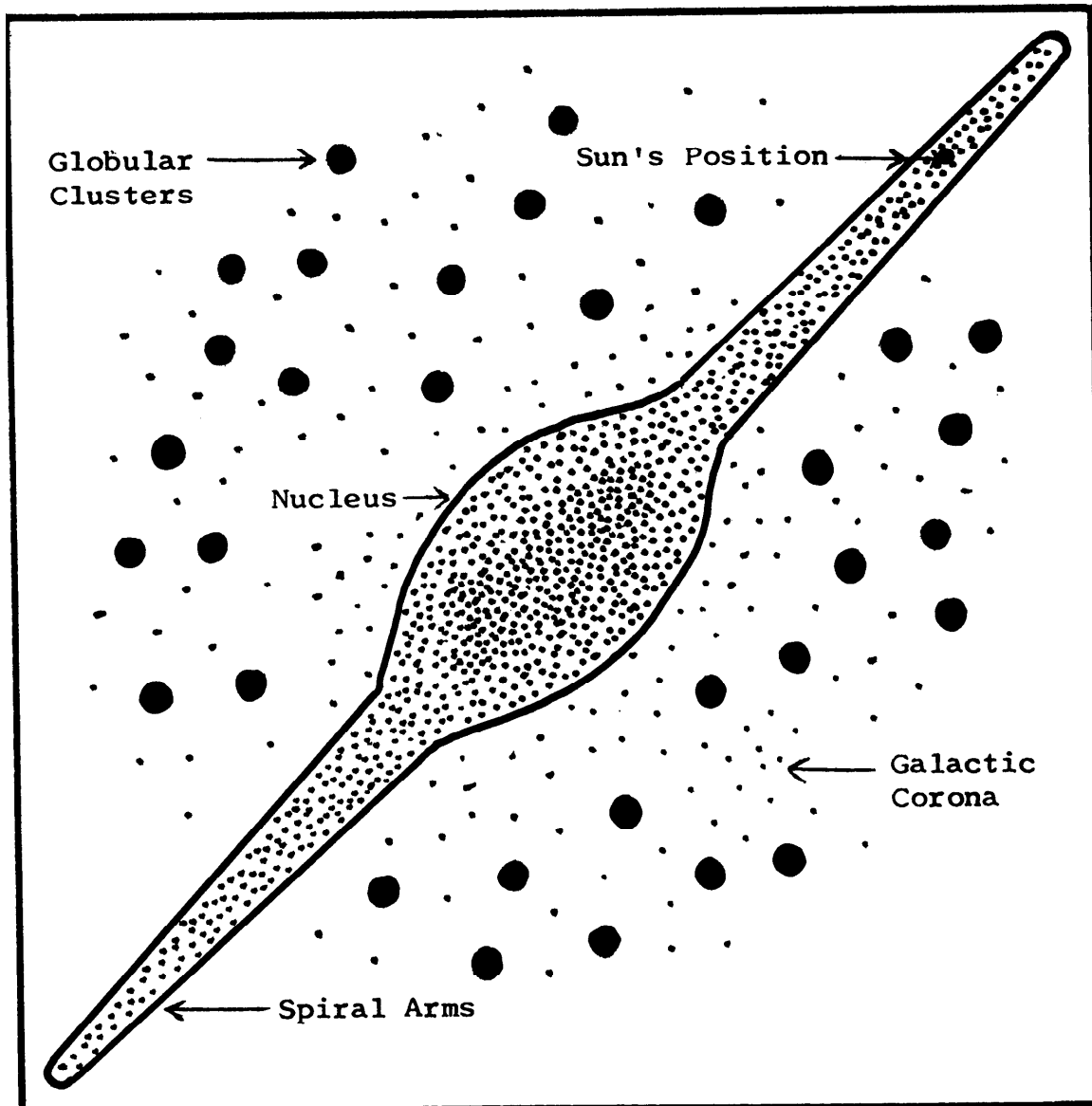


Figure 4. Our galaxy, edge-on view, showing galactic corona and globular clusters (satellites of the galaxy). No evolutionary theory has explained the origin and maintenance of the galaxy or its satellites.

To begin with, the analogy with star formation is of little help because our grasp of its later phases is still dim. Further, we should not expect any major resemblances because the end product, a galaxy, differs so much from a star, and not only in size. Even more serious is that the theory of star formation assumes that the condensing mass consists exclusively of koinomatter (regular matter). The theory, of course, readily lends itself to antimatter, but it falls down when confronted with a mixture of koinomatter and antimatter: an ambiplasma. By its very nature, ambi-

plasma must incur annihilation, which may be of fundamental importance.²⁵

The early stages of galaxy formation are incomprehensible enough, but, he adds, "The further development of galaxies poses a much more formidable problem."²⁶ The Encyclopedia Britannica concurs with this view, terming this whole area "a challenge to cosmogonical thought."²⁷

While the popular literature on the subject speaks blithely of "protogalaxies" as though they were an everyday reality, none has ever been observed, and no satisfactory model of one has ever been put on paper.²⁸

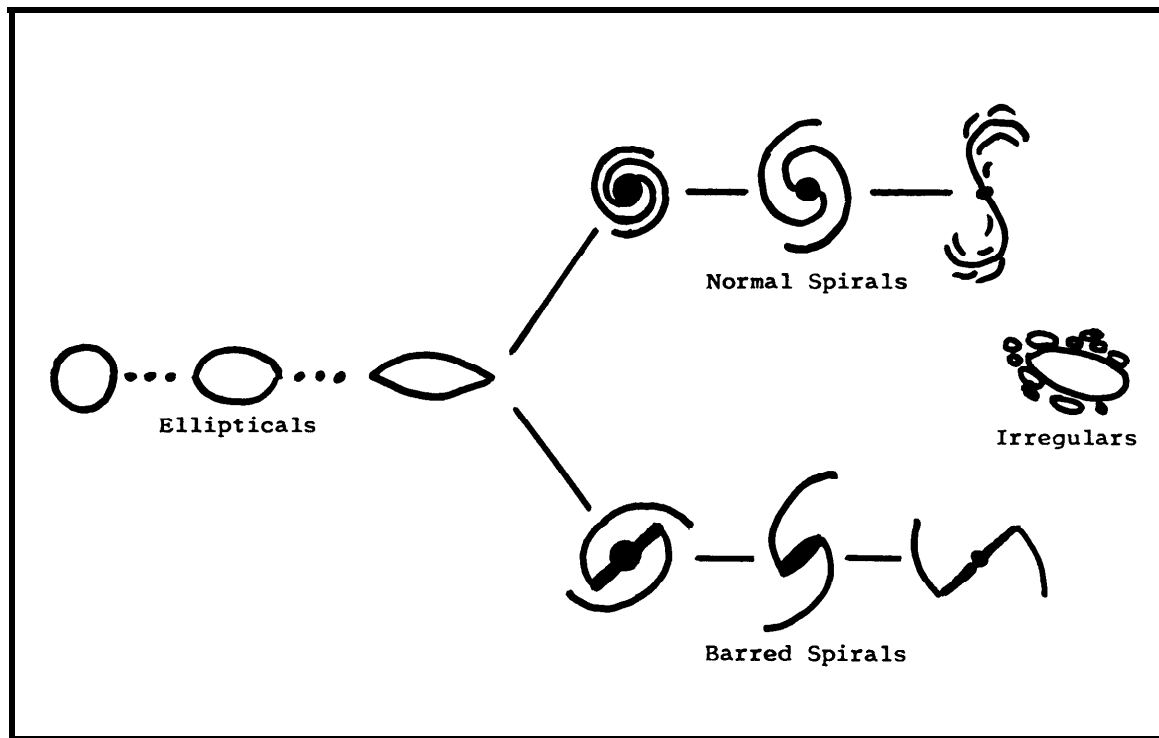


Figure 5. Hubble "Tuning-Fork" Diagram of galactic types. Hubble believed that galaxies evolve from left to right along the upper route; Shapley held that the evolution was from right to left. The consensus today is that galaxies do *not* evolve from one type to another.

Galactic Evolution

Do galaxies gradually evolve from one type to another over millions or billions of years? The current view is that *they do not*. Just how this position has become respectable constitutes an interesting historical study.

We find in the heavens several distinctly different types of galaxies—normal spirals, barred spirals, ellipticals of varying degrees of flatness, and irregulars. Several decades ago Hubble arranged these into his well-known "tuning-fork diagram" shown in Figure 5. It was his belief that galaxies evolved from left to right on the diagram starting with a round elliptical, gradually flattening, and eventually developing into a spiral type via the upper route. Finally, he proposed that they lose all structure from their spiral arms and form an irregular galaxy.²⁹

Shapley, on the other hand, felt it more reasonable that they should evolve from right to left. But the important thing seemed to be that, at all cost, they should *evolve*.

In both schemes the upper route of the fork was followed, and no satisfactory explanation was offered for the existence of the barred spirals—those possessing a straight bar-like structure at their center. Even today these constitute a real puzzle. Hodge states:

Another important dynamical problem that is not solved is the problem of explaining the existence of the bars in the barred spiral galaxies. These masses of stars do not obey any reasonable dynamical model and may be held in place by some nongravitational force such as a strong magnetic field. Just how this can work is not yet known³⁰ (See Figure 6)

The barred spiral galaxies are best explained by a recent Creation. On the basis of what we know today, these structures must be extremely young, or the bars would long since have been bent into spirals in keeping with Kepler's Second Law.

Neither the Hubble nor the Shapley theory was based on actual physical evidence. Today it is generally felt that angular momentum considerations rule out such evolution from type to type. Abell summarizes the situation as follows:

There is much doubt, however, that galaxies evolve from one type to another at all. The fact that different kinds of galaxies are flattened by different amounts almost certainly results from their having different amounts of angular momentum—that is, from their different rotation rates. In other words, galaxies might always have had essentially their present forms (at least since their formation),



Figure 6. Barred Spiral Galaxy in Eridanus (NGC 1300). Astronomers are at a loss to explain how the bar is maintained over long periods of time. The problem is solved very neatly by a recent Creation.

the form of a particular galaxy depending mostly on its mass and angular momentum per unit mass.³¹ It is gratifying to see that many astronomers are no longer attempting to make a dichotomy between "young" and "old" galaxies. Hodge writes:

Our conclusions, then, are that the sequence of the classification of galaxies is not an evolutionary sequence . . . The best evidence available now indicates that they are all of approximately the same age, at least all of those near enough to our galaxy for this to be estimated.³²

The Problem of Planets

Although there remains an unshakeable confidence among the general pseudo-intellectual public that the earth and other planets condensed from "the same cloud that formed the sun," the real savants in the field are at a loss to explain just what is supposed to make the small particles of material aggregate together into a larger body (if indeed one can even take the smaller particles for granted).

Thomas Gold of Cornell, writing on "Problems Requiring Solution," lists as Problem No. 1: "the method of agglomeration of solid pieces. How do they manage to stick together, especially over a certain range of size?"³³ Iron particles, he submits, might stick together by magnetism up to a certain size but beyond that there is a "difficult gap between objects that are centimeters or a meter in size, and those that are gravitationally active (a kilometer or more in size)."³⁴ "This gap is the most difficult to bridge, because as yet gravitation is not in the picture."³⁵ He then mentions the possibility that comets might form nuclei of accretion, but fails to explain where they came from.

Hoyle takes a different tack. He has conceived the ingenious idea of freezing the fragments together with water.³⁶ Unfortunately, however, he fails to disclose where his H₂O was synthesized. Also, he concedes the possibility that heat from the sun could melt the ice and sabotage the whole scheme. It is also well to note here that all space probe analyses of planets in our solar system to this date indicate an absence of extra-

terrestrial water. It is questionable then whether one should feel free to postulate water elsewhere in space as Hoyle does.

An earlier idea of Hoyle's involved the use of oil or pitch as a binding agent. Virtually everything from "chewing gum" to "baling wire" has been attempted to fasten planets together, but still the problem remains.

The December 23, 1966 issue of *Time* carried a typical sensationalistic article concerning the imagined formation of another solar system in the constellation Monoceros. Based on a paper by Low and Smith in *Nature*,³⁷ the article described observations on the twelfth magnitude star, R Monocerotis. The object, according to the details given in the original paper, is nothing more or less than a hot star surrounded by a thick blanket of gas and dust. And yet the paper was given the very presumptive title, "Infrared Observations of a Preplanetary System."

There is no experimental evidence presented that the object is indeed contracting as it is supposed to be. It may actually be expanding from the heat of the star. In fact, much of the observed debris may have been spun off from the star; nothing is securely established concerning the rotation of the star or the cloud. Thus, what may well be just another degenerative phenomenon, has been interpreted, with a generous measure of wishful thinking, as a "creative" process.

Let us keep firmly in mind the stark fact that our solar system is the only planetary system that has ever been observed. All the other billions of solar systems that are supposedly out there somewhere have been inferred by very questionable statistical rationalizations rather than solid physical evidence.

What *have* been observed are several binary systems in which one member of the system is extremely dim or even dark, and hence invisible with our best telescopes (astrometric binaries). In such a case the existence of the companion is *inferred* by the wavy path of the bright member. The best authorities still disagree on whether such a dark object should be considered an oversized planet or a small star.

Multiplicity of Star Types

One might derive the impression that, compared to the biological world, the stellar world is somewhat monotonous—that there are stars, stars, and more stars. This is hardly the case, however. Their diversity in both structure and function is staggering. Indeed, "one star differeth from another" (I Cor. 15:41) to the extent that no two are exactly alike.

Stars can differ in size, mass, density, color, brightness, temperature, rotation rate, composition, spectral lines or bands, stability, magnetic field strength, nature and extent of atmosphere

or envelope, period (for variable stars), radio emission, corpuscular radiation, and many other factors such as whether they are single, binary, or members of a more complex system.

Ideally, there should probably be as many categories of classification as there are stars. But for practical reasons some fairly broad arbitrary groupings have been set up. Even an abridged list of the types of stars and stellar objects that are encountered in the literature would be too lengthy to include in this paper.

"Missing Links"

The burden of proof is upon the evolutionist, who claims that every object is serially related to other objects, to demonstrate observationally the *intermediate* stages between the various types. In many cases there has not even been a theoretical treatment of the imagined transition. Some of the specific obstacles that exist will be considered at this point.

(1) **Pulsating Stars** are unstable stars that alternately increase and decrease in brightness. There appears to be an accompanying oscillation in size, like a balloon being alternately inflated and deflated. Many distinctly different types exist; a few of which are (a) the RR Lyrae variables, with short periods of from 0.3 to 0.7 days; (b) the classical Cepheids, with periods of 1 to 50 days; (c) the W Virginis variables, with similar periods but 1 to 2 magnitudes fainter; (d) Mira-type variables, with long periods of from 80 to 1000 days; (e) semi-regular variables; (f) irregular variables; and (g) spectrum variables.

How a "normal" star is supposed to lose its stability and evolve into a pulsating star is indeed a great mystery. And how it is then supposed to regain its stability and evolve into still another type is equally baffling. Inglis concedes, "Why the star began to pulsate in the first place is not understood completely, but we know that some unbalanced forces must have developed that caused an initial expansion or contraction."³⁸—which is about as specific as the Delphic Oracle. Obviously the question concerns the internal structure of stars which cannot be observed; hence guesswork and imperfect, oversimplified models are the only tools at our disposal.

(2) **T Tauri Stars** are highly unstable reddish objects that are claimed to be the link between interstellar clouds and Main Sequence stars. Well over a thousand of these stars have been identified in the galaxy.

But the T Tauri stars differ radically from the model predicted by stellar evolution theory. They are surrounded by thick and highly active outer atmospheres. Rather than pulling in matter from the surrounding space as might be ex-



Figure 7. Planetary Nebula in Aquarius (NGC 7293). Such nebulae are alleged to be an evolutionary link between red giants and white dwarfs. However, none has even been observed in the process of evolving from anything else or to anything else.

pected, they are ejecting vast quantities of material *from* the star! Also they show a great overabundance of lithium, which would have no conceivable means of building up to that level during the star's "short" history, especially considering that thermonuclear reactions have supposedly not yet started.

George Herbig, astronomer at Lick Observatory, after discussing these peculiarities at some length, presents this summary:

What physical processes or attributes could account for the distinctive features of the T Tauri stars: Their extremely active and luminous chromospheres, their massive ejections of surface material, their variability in brightness, their high lithium abundance? None of these phenomena are predicted by the modern theory of the contraction of young stars. Each is still a complete mystery.³⁹

The logical conclusion is that the T Tauri stars are *not* the link between interstellar gas and Main Sequence stars that the theorists are so

desperately seeking; the "real link" must still be missing.

(3) Planetary Nebulae are slowly expanding shells of gas surrounding certain very hot stars. (See Figure 7) Stellar evolutionists have been, for some time, trying to establish planetary nebulae as a link between red giants and white dwarfs. It is generally agreed that they have a catastrophic origin such as an eruption of the central star. But, according to Meadows, "... no explosion producing such a nebula has ever been observed."⁴⁰

Perhaps the leading authority on planetary nebulae today is Lawrence H. Aller of U.C.L.A. who states in a recent article, "... we may someday find a young object that is evolving into a planetary ... but none is now known."⁴¹

Inglis reviews several "possible candidates for the job of supplying the universe with planetary nebulae" such as novae, Wolf-Rayet stars, RR Lyrae stars and red giant irregular variables, and concludes, "... none of these seems

to fill the bill completely; astronomers are left with another puzzle to solve.⁴²

(4) **White Dwarfs** are extremely small stars that are thought to consist mostly of “degenerate matter”—that is, matter that is presumed to have collapsed to a fantastically high density. (The possibility that they were created as white dwarfs is not even entertained as a hypothesis.)

Current dogma has it that red giants evolve into white dwarfs. We are told that our sun will some day go the way of all stars that have exhausted their supply of hydrogen—dissipating itself to become a red giant, and then somehow collapsing into a white dwarf. However, the “route” that is taken on the Hertzsprung-Russell diagram to reach the white dwarf “stage” is only surmised by compounding hypothesis upon hypothesis. According to Brandt, “Precisely how the future sun reaches this area of the H-R diagram is unknown. The path may be along the sequence of subluminescent hot stars . . . since these objects are commonly thought to be very advanced in their evolution.”⁴³ Obviously, guesswork abounds.

Abell concurs: “The evolution . . . from red giant to white dwarf is speculative only. Perhaps the star goes through a stage of variability, or emits material as a planetary nebula.”⁴⁴

We become increasingly suspicious when we note that some astronomers claim white dwarfs to be remnants of supernovae, while others maintain that white dwarfs evolve into supernovae! Regardless of what the facts may eventually turn out to be, evolution must, for the present, be served.

It should be apparent to the thoughtful Christian that the entire system of stellar evolution has been built upon a premise that is implicitly atheistic. The uniformitarian mind demands that every astronomical object be explained by some “previous stage of development.” Never is there a willingness to admit a bona-fide Creation at any point.

Age Discrepancies

One of the more entertaining aspects of this study is a consideration of some of the inconsistencies that come up with respect to the cosmic time scale. When modern theorists attempt to force an evolutionary framework upon a degenerating universe, such discrepancies are bound to occur, and many of the problems become increasingly worse the more that is done for them.

(1) **Age of Universe:** Let us compare the age of the universe according to various authorities in the field of astronomy. Their lack of agreement should speak volumes to us concerning the reliability of their dating methods:

<i>Estimated Age of Universe</i>	<i>Authority</i>
4.3-5 billion years	Gamow ⁴⁵
7 billion years	Peebles and Wilkinson ⁴⁶
10-15 billion years	Ashford ⁴⁷
70 billion years	Shklovski ⁴⁸
trillions of years	Alfvén ⁴⁹
infinitely old	Hoyle ⁵⁰

One thing is eminently certain. Not all of these men can be right. Yet at least four of them are considered to be first-rate cosmogonists.

What “dating methods” are used? The cosmogonist simply picks a number that he feels is large enough to encompass all the imagined evolutionary processes of ages past. But no two men can quite reach agreement as to what *has* taken place in the past.

Would any of these men be willing to face an honest Creation at the time in the past specified? Of course not! They have a most evasive way of dealing with the problem of Creation, pushing it farther and farther back in time, but never coming to grips with the real heart of the matter. Typical of the cosmogonists is Alfvén who says, “We beg leave to sidestep the question, ‘What happened before then?’”⁵¹ Prior to this point in time the “model” ceases to be “relevant for us.”⁵²

The smaller estimates are based on inferred recessional velocities of distant galaxies as calculated from observed red shifts. Implicit in such a calculation is the assumption that the red shifts (displacement of spectral lines toward longer wavelengths) are in fact due to a Doppler effect. There are today astronomers, such as Gerald Hawkins of Boston University, who do not accept this interpretation.⁵³ Most frequently the alternative explanation that is offered involves some sort of “tired light” phenomenon.

Recent research on quasars has rendered the Doppler interpretation more than a little questionable. *One quasar displays five different red shifts.* The following is taken from the 1968 news bulletin of the American Institute of Physics:

Experimental and theoretical work being done at the University of California (San Diego), Kitt Peak Observatory in Arizona, and California Institute of Technology shows that several different red shifts can be fitted to the absorption spectra of a single quasar. In the most extreme case, one quasar displays 5 red shifts that range from 1.36 to 2.20. Obviously only one red shift can be due to the motion of the entire object, so something must be proposed to account for the others.⁵⁴

(2) **Spiral Galaxies:** A very serious age discrepancy is observed in the spiral arms of gal-

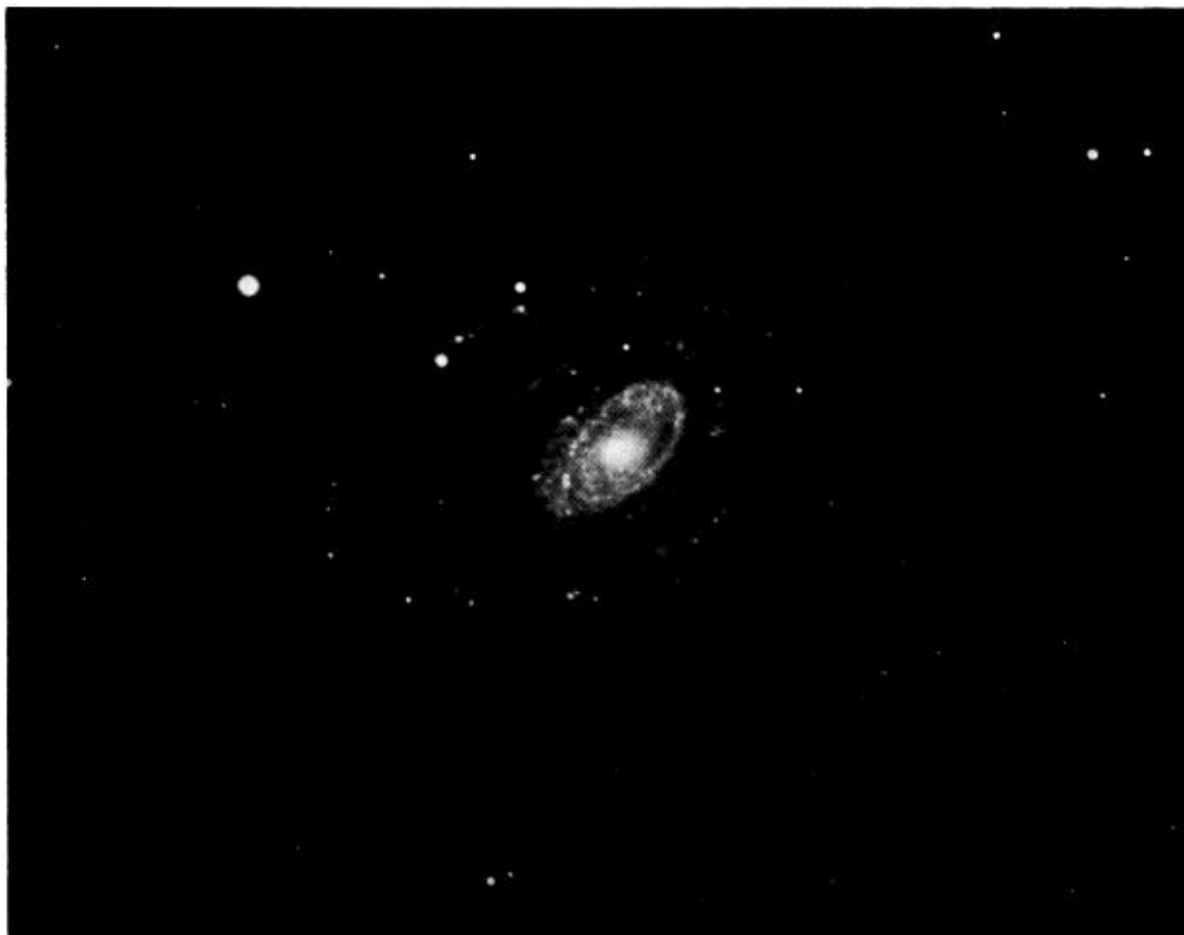


Figure 8. Normal Spiral Galaxy in Virgo. If such galaxies are as old as is claimed, their arms should be wound up 100 times. In actuality they rarely exhibit more than two complete turns. This is possibly the most glaring age discrepancy facing astronomers today.

axies. This writer first became aware of this source of embarrassment to evolutionists when reading *Galaxies and Cosmology* by Paul W. Hodge several years ago. Hodge presents the problem as follows:

The rotation times for spiral galaxies are approximately 10^8 years, halfway out from the center, but the ages of the spiral galaxies are approximately 10^{10} years. Therefore, one would expect that a spiral arm formed at the beginning of the galaxy's history would now be wound up 100 times. In actual fact most spiral arms of galaxies show only one or two complete turns.⁵⁵

A typical spiral galaxy is shown in Figure 8. If it were as old as is claimed, it would be coiled up into a tight disc, with no lanes showing between the hundred or so turns in the arms.

Theoreticians had hoped that the difficulty could be resolved rather simply by showing that the entire galaxy turns as a unit—that the arms

are frozen into a permanent shape by a magnetic field. But Halton Arp of the Mount Wilson and Palomar Observatories rejects this explanation in a recent article: "The magnetic field which runs through the gas in an arm is not strong enough to give appreciable rigidity, and in any case the stars are not coupled to this magnetic field."⁵⁶

Something else was therefore proposed—the density-wave theory. According to this idea, alternate regions of condensation and rarefaction rotate around the galaxy at constant velocity. However, Arp quickly shows that this is no panacea either: "... There is a whole class of spirals that contain little or no disc in which the density waves could be transmitted."⁵⁷

Arp then suggests that the spiral arms may simply be the tracks of material ejected from the galactic nucleus. Differential rotation would form such tracks into a spiral pattern. However, Arp fails to give a convincing explanation of

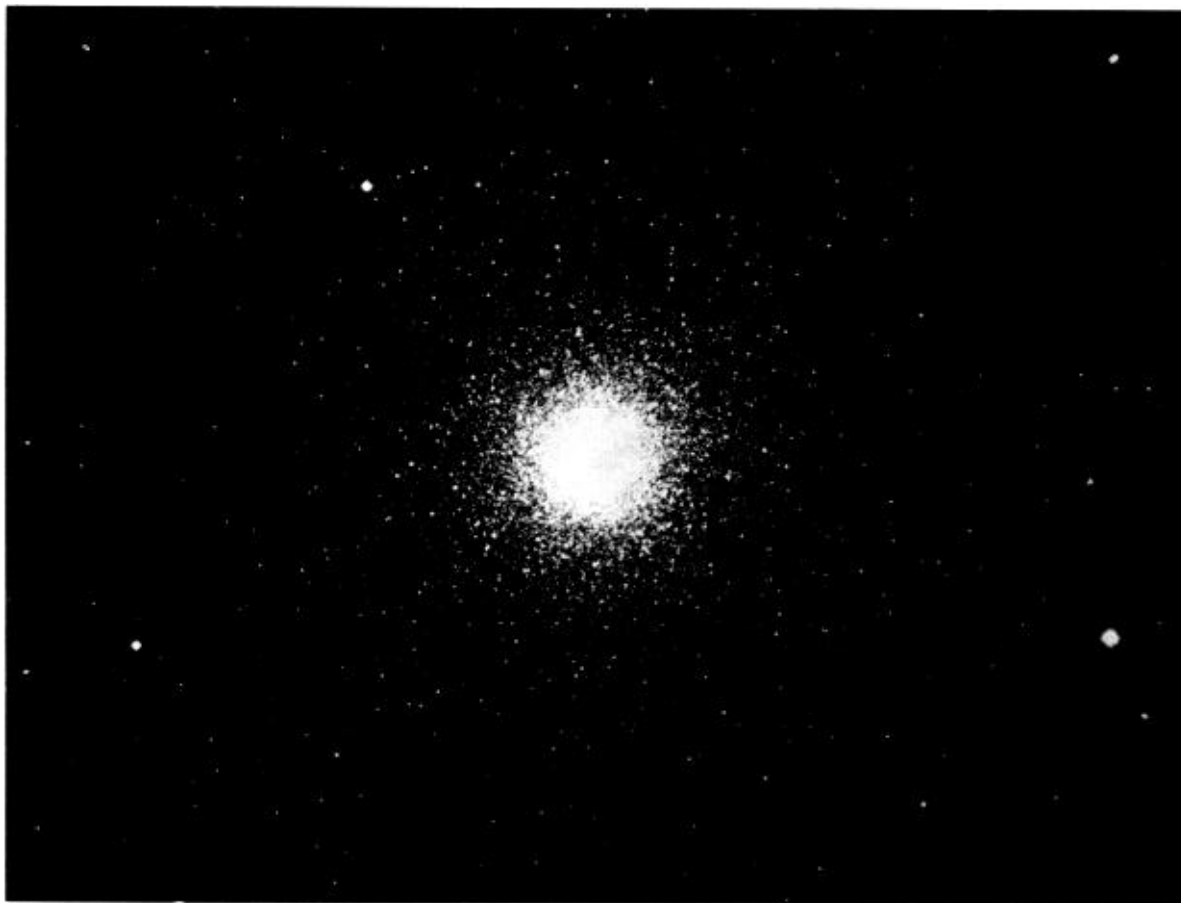


Figure 9. Globular Cluster in Canes Venatici (M3). The age of this cluster has been estimated at 26 billion years, in serious conflict with the generally held view that the universe is only 7-10 billion years old.

why such ejections that occurred near the “beginning” have not yielded highly coiled systems; we are back to our original problem. It would seem more logical to believe that spiral galaxies are considerably younger than has been supposed.

(3) **Globular Clusters:** These are roughly spherical assemblages of stars that orbit around our galaxy as satellites. (see Figure 9) It is currently believed that such clusters are “very old” because they appear to be “highly evolved.”

Some age estimates of globular clusters (e.g., M3 and M5) run as high as 26 billion years.⁵⁸ Obviously, the men who make such claims do not enjoy close fellowship with those who hold to a 7-billion-year-old universe. The more one studies the utterances of present-day astronomers the more one realizes how little concord exists. We are beset today with a hodgepodge of mutually contradictory ideas, brought about by a desire to superimpose an evolutionary framework on a degenerating universe.⁵⁹

In the case of the M3 cluster an embarrassing

situation has come to light. The problem, somewhat oversimplified, is this: If the cluster is as old as is claimed, why does it contain a number of “young” stars?⁶⁰ These relatively hot blue Main Sequence stars could not have existed for any great span of time, or their fuel would long since have been depleted.

As an explanation for this dilemma we are asked to believe that the blue stars condensed billions of years later than those in the rest of the cluster. But from what? The cosmogonist is woefully lacking in raw materials here, since globular clusters are notorious for their lack of interstellar material.

(4) **Binary Stars:** Pairs of stars that revolve about a mutual center of gravity are called binaries. It is now generally conceded that both members of such a pair were formed at the same time.⁶¹ Yet one member of the pair is often a “young” star while the other is a “highly evolved” star.

Sirius, a nearby system, consists of two components: Sirius A, a bright blue Main Sequence

star; and Sirius B, a dim white dwarf. Sirius A is supposed to be a "young" star because fuel is being consumed at such a prodigious rate that it could not have been doing so for very long. Sirius B, on the other hand, has supposedly evolved through all the many stages leading to a white dwarf including T Tauri, Main Sequence, and red giant.

How can these things be? How can one star of a binary system appear young while the other appears old, yet both are acknowledged to be the same age? Theorists in the field seem satisfied with the explanation that Sirius B simply "evolved faster." With such a flexible theory one can play this game any way he pleases.

Like biological evolution it explains too much; any set of data can be rationalized to fit the theory by one means or another. A theory that is this insensitive to the observational data stands little chance of ever being overthrown.

Conclusions

1. There are many weak links in the hypothetical evolutionary life cycle of a star. The weakest of these is the alleged spontaneous birth of stars from interstellar material. Both scientific data and Scripture militate strongly against the doctrine of continuous star formation. This idea has undoubtedly come about as a consequence of the implicitly atheistic assumptions that underlie the majority of present-day astronomical speculations.

Observation and revealed truth both point to the creation of all stars at a definite time in the past *by processes totally dissimilar to present processes*. The present astronomical economy involves degeneration, dissipation, and "running down" in stars, whereas there must clearly have been an initial period of organization and "winding up."

2. The problem of how galaxies are supposed to structure themselves from primordial material is one of the most enigmatic questions in the whole realm of cosmogony. Few cosmogonists have been willing to undertake study of this problem. Those who have attempted it have failed disastrously.

The question of the inability of galaxies to maintain their structure over long periods of time is one that needs serious study by Christian men of science. This would appear to be a promising avenue of research for establishing a recent Creation.⁶²

3. There is still no acceptable evolutionary explanation for the existence of planets. According to our present understanding, solid particles would fail to agglomerate to form even small chunks of material, let alone planets. That

planets do form spontaneously is held today strictly as an article of evolutionary faith.

4. Astronomical dating methods appear to be entirely devoid of scientific value, since they involve guessing at an evolutionary history for the object being dated. The fact that astronomers disagree widely on such imagined histories accounts for the many serious age discrepancies in the literature today.

Age estimates are continually being inflated to keep step with the philosophical views of the times. Why, if cosmogonists are actually in possession of the truth at any given moment, must they change their theories and age estimates the next moment?

5. The evolutionary approach is utterly bankrupt when it comes to explaining the ultimate origin of anything. To the evolutionist, each stage of development requires a previous stage. Never can there be a true beginning. Yet scientific data and Scripture both demand such a beginning. The most satisfactory explanation for the origin of stars, galaxies, and planets is a rapid and miraculous Creation which endowed the heavens initially with all the diversity of structure and function that we observe today.

Acknowledgments

I am greatly indebted to Dr. Emmett Williams, fellow member of the Bob Jones University Science Department, whose thorough going knowledge of thermodynamics was most helpful on numerous occasions. Mr. Gary Guthrie of the Bob Jones University Mathematics Department was kind enough to provide a final check on my calculations, while Dr. Stewart Custer, Dr. Fred Afman, and Mr. Arend tenPas of our Bible faculty assisted in questions of interpretation of the Scripture portions cited; all three of these men concurred with the position set forth in this paper. Comments and suggestions by these five colleagues were greatly appreciated since there is such an appalling dearth of Christian literature on the subject.

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- ⁵Jastrow, R. and A. G. W. Cameron, editors. 1963. *Origin of the solar system*. Academic Press, N. Y., pp. 39-53.
- ⁶*Ibid*, p. 43.

⁷*Ibid*, p. 44. The mass of the cloud divided by its radius squared must be equal to $7.6 \times 10^{-3} \text{ gm/cm}^2$. Using cgs units,

$$\frac{2 \times 10^{33}}{r^2} = 7.6 \times 10^{-3}$$

$$r^2 = \frac{2 \times 10^{33}}{7.6 \times 10^{-3}} = 2.63 \times 10^{35} \text{ cm}^2$$

$$r = 5.13 \times 10^{17} \text{ cm or } 5.13 \times 10^{15} \text{ meters}$$

The volume of the cloud V_1 is $\frac{4}{3}\pi r^3$. Using MKS units,
 $V_1 = (4/3) (3.14) (5.13 \times 10^{15})^3 = 5.64 \times 10^{47} \text{ m}^3$

⁸*Ibid*, p. 42.

⁹*Ibid*, p. 42. The sun's radius is 432,000 miles. One hundred times this value is 43,200,000 miles or 6.95×10^{10} meters. The volume of the condensed material V_2 is $\frac{4}{3}\pi r^3$. Using MKS units,
 $V_2 = \frac{4}{3}\pi (6.95 \times 10^{10})^3 = 1.40 \times 10^{33} \text{ m}^3$

¹⁰The use of C_p rather than C_v is called for in this calculation since the volume is not constant.

¹¹It can be shown that such a system should radiate away about half of its energy as it contracts. (See Smith, C. M. H. 1966. A textbook of nuclear physics. Student Edition. Pergamon Press, Oxford, p. 757.) If this energy were to remain in the cloud, its temperature would increase to 200,000°K rather than 100,000°K for T_2 . Recalculating for this situation we still obtain about -30 eu/mole. Another objection that might be raised is that the initial cloud might be far larger and more massive, condensing into a cluster of stars rather than a single star. However, the same order of volume and temperature ratios would obtain, and our basic argument still stands.

¹²Page, T., and L. W. Page, editors. 1968. Stars and clouds of the Milky Way. The Macmillan Co., N. Y., pp. 246-253.

¹³Brandt, J. C. *Op. cit.*, p. 60.

¹⁴For the condensed material at 100,000°K, the force outward is 7.1×10^{28} newtons; the force inward is 8.2×10^{28} newtons. However, the outward force due to rotation has been ignored in this calculation.

¹⁵These equations may be combined to give

$$r = \frac{GM^2}{2nRT}$$

This is an expression for the radius at which the outward and inward forces are equal. It is not especially useful for our present purposes, however, because of the temperature uncertainty.

¹⁶Jastrow, R., and A. G. W. Cameron. *Op. cit.*, pp. 43, 44.

¹⁷Page, T., and L. W. Page. *Op. cit.*, p. 210.

¹⁸Mulfinger, G. 1967. Examining the cosmogonies—a historical review. *Creation Research Society Quarterly*, 4:57-69.

¹⁹Brandt, J. C. *Op. cit.*, p. 112

²⁰*Ibid*, p. 112.

²¹Jastrow, R., and A. G. W. Cameron. *Op. cit.*, pp. 40, 43.

²²*Ibid*, p. 41.

²³*Ibid*, p. 42.

²⁴Herbig, G. H. 1967. The youngest stars, *Scientific American*, August, pp. 30-36.

²⁵Alfvén, H. 1966. Worlds-antiworlds. W. H. Freeman and Co., San Francisco, Calif. p. 77.

²⁶*Ibid*, p. 78.

²⁷Encyclopedia Britannica. 1964. "Cosmogony." p. 580.

²⁸The magnitude of the problem may be surmised from a recent issue of *Sky and Telescope*. On page 302 of the November, 1969 issue a model is described in which three cosmogonists started with 115,000 small gas clouds already arranged in a flat disc and already moving at the proper rotational speed! Is there no limit to how much contriving is considered legitimate?

²⁹See Hodge, P. W. 1966. Galaxies and cosmology. McGraw-Hill Book Co., Inc., N. Y., pp. 6-14, 116, 117, for a good discussion of these early theories.

³⁰*Ibid*, p. 123.

³¹Abell, G. *Op. cit.*, p. 629.

³²Hodge, P. W. *Op. cit.*, p. 122.

³³Jastrow, R., and A. G. W. Cameron. *Op. cit.*, p. 171.

³⁴*Ibid*, p. 171, 172.

³⁵*Ibid*, p. 172. This difficulty is discussed in Whitcomb, John C. 1964. The origin of the solar system. Presbyterian and Reformed Publishing Co., Nutley, N. J. p. 12. Also Whitcomb's paper in the September, 1967 *Creation Research Society Quarterly* lists nine obstacles with which the best theories of the solar system are unable to deal successfully.

³⁶*Ibid*, p. 68.

³⁷Low, F. J., and B. J. Smith. 1966. Infrared observations of a preplanetary system, *Nature*, 212:675, 676.

³⁸Inglis, S. J. *Op. cit.*, (Reference #2), p. 275, 276.

³⁹Herbig, G. *Op. cit.*, p. 35.

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⁴²Inglis, S. J. *Op. cit.*, p. 298.

⁴³Brandt, J. C. *Op. cit.* (Reference #3), p. 118.

⁴⁴Abell, G. 1964. Exploration of the universe. First Edition. Holt, Rinehart, and Winston, N. Y., p. 532.

⁴⁵In Gamow's *The creation of the universe*, 1952, (p. 32 in the Bantam Books Edition) he assured us that a former discrepancy had been rectified, and that the age of the universe had been securely established at 4.3 billion years. (Prior to that it had been 1.7 billion.) Yet in a later book he had increased the estimate to 5 billion. See Gamow, G. 1958. Matter, earth, and sky. Prentice-Hall, Inc., Englewood Cliffs, N. J., p. 518.

⁴⁶Peebles, P. J. E., and D. T. Wilkinson. 1967. The primeval fireball, *Scientific American*, June, p. 28.

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⁴⁸Article entitled, Universe 70, not 10 billion years old, Shklovski says, in *Scientific Research*, October 1967, p. 23.

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⁵⁰Hoyle, F. 1960. The nature of the universe. Signet Science Library, N. Y., p. 113.

⁵¹Alfvén, H. *Op. cit.*, p. 70.

⁵²*Ibid*, p. 70.

⁵³Hodge, P. W. *Op. cit.* (Reference #29), p. 161.

⁵⁴Physics in 1968—News from the American Institute of Physics, p. 12.

⁵⁵Hodge, P. W. *Op. cit.*, p. 123.

⁵⁶Arp, H. 1969. On the origin of arms in spiral galaxies, *Sky and Telescope*, 38:385.

⁵⁷*Ibid*, p. 385.

⁵⁸Coleman, J. A. 1963. Modern theories of the universe. Signet Science Library, The New American Library, N. Y., p. 121.

⁵⁹Evidence for a degenerating universe was discussed in Mulfinger, G. 1968. Degeneration processes in the cosmos, *Bible-Science Newsletter*, September, 1968, p. 1.

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⁶¹Huang, S. S. 1967. The origin of binary stars, *Sky and Telescope*, 34:369,370.

⁶²Another matter that should carefully be studied by Society members is the inability of comets to remain intact over long periods of time, and the implications of this fact on the date of Creation.

THE EARTH IN SPACE AND TIME

HAROLD W. CLARK*

This paper discusses the problem of the origin of the earth and heavenly bodies in the light of the Genesis record and modern scientific discoveries.

Since introduction of pagan philosophical interpretation into Christian theology in the fourth and fifth centuries A.D., Christian scholars have had to battle against evolutionary theories.

Modern astronomy has pushed back the bounds of the universe both in space and time, but so far as any explanation of the manner of its origin, nothing but hypotheses have been offered. No proofs of any kind have been forthcoming.

Atomic physicists have given strong support to the doctrine of creation by discovery of the relation between matter and energy. But no explanation has ever been offered that will show the source of the energy units from which material substance was derived. The Bible alone answers the question by saying that "by him all things consist." (Col. 1:17)

Attempts to push the time of the flood and creation back many thousands of years beyond the records of Genesis have met with very serious problems, and a careful analysis of the situation supports the "short-time" chronology.

It is important that Christian scholars avoid being "uniformitarian creationists" and thereby surrender the fundamental principles of true creationism.

From the beginning of human records, man has been concerned with the great mysteries of existence: how did the earth and life originate, what relation does the earth sustain to the rest of the universe, and how was this relationship established? Two philosophies have been developed—*cosmology*, which attempts to describe the universe in space and time, and *cosmogony*, which attempts to solve the problems of origin, nature, and purpose of the cosmos.

The purpose of this paper is to discuss the above questions in the light of modern scientific discoveries and of the Genesis record, and to see what conclusions can be reached that will be acceptable to the scientific Christian scholar. So much has been written about cosmology and cosmogony of ancient and medieval times that it is hardly necessary to go into that phase of the subject, except to point out very briefly the influence these ideas have had on modern scientific interpretation.

When Christianity became the dominant factor in the thought of the western world, its basic philosophy was founded on the Genesis record which set forth three fundamental principles: (1) that Jehovah God had created the heavens and the earth, (2) that this world and kinds of life were made in six days, and (3) that most of the life on earth was destroyed by a universal Deluge, known as the Noachian Flood.

In opposition to this world-philosophy, various pagan nations had their cosmogonies, none of which have proved to be of any real significance in solving the great problems of existence, either of the earth or of life upon it.

Had proponents of Christianity retained a firm commitment to the creation record of Genesis, modern science might have developed with quite a different emphasis than it has. But when Augustine and other theologians brought certain Greek ideas of the origin of the earth and the origin of life into Christian theology in the fourth and fifth centuries A.D., a dualism resulted which was very influential in the development of modern scientific philosophy. On one side of the question was the creation doctrine based on a literal interpretation of the Genesis record; and on the other side was the idea of long ages of evolutionary progress.

Beginning of Modern Science

In order to understand how these two conflicting views have influenced twentieth century philosophy, let us start with what might be considered the beginning of modern scientific thought, the work of Sir Isaac Newton. His studies on gravitation laid the foundation for celestial mechanics. Instead of men believing as they formerly had, that the movements of heavenly bodies were erratic, after Newton they came to realize that all existence is under the control of law, and that order and system prevail throughout the universe. The whole development of modern science is said to have begun with the publication of Newton's *Principia* in 1687. His mathematical principles, as set forth in this famous work, guided scientific men from that time on as they extended their search for natural knowledge.

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Sir William Herschel, an English astronomer, followed in the footsteps of Newton, and became the founder of sidereal astronomy. Some of his discoveries have had a profound influence in modern cosmology. His work was done between 1780 and 1822, approximately a century after Newton.

His work on the Milky Way led to the conclusion that the sun lies near the center of a flattened disc of stars with a radius of 2,000 parsecs (a parsec is 3.26 light-years, that is, 3.26 times the distance light will travel in a year) in its short radius, and about 30,000 parsecs in its longer distance.

Herschel saw nebulae, and compiled a list of 2,500. He suggested the idea of "island universes," but his ideas were so far in advance of the thinking of his time that it was over 100 years before this interpretation was accepted. It was not until 1924 that nebulae were recognized as galaxies. This was largely due to the work of E. P. Hubble of Mt. Wilson and Palomar observatories. He found evidence of stars far beyond our galaxy, and surveyed nebulae and found them distributed in all directions. From a study of several thousand photographs he derived a significant classification of other galaxies beyond the Milky Way.

The Palomar 200-inch telescope with which Hubble worked now reaches a billion galaxies, some of which are a billion light-years from the earth. The search for a fixed center of the universe had shifted away from the earth to the sun; then as the sun became only a minor member of the Milky Way galaxy, the search shifted to the greater universe beyond, for even the Milky Way galaxy appears to be only one of a number of large galaxies.

Origin of the Universe

With all this amazing array of information regarding the universe, where do we now stand philosophically? The problem now shifts from the nature of the universe to the question of the manner and time of its origin. Study of radioactive elements has led many scientists to believe that the universe may be as much as five billion years old.

The suggestion has been made that matter originated under the influence of a number of significant factors, such as, for instance: (1) the presence of high temperatures, (2) the presence of free neutrons, protons, and electrons, (3) progressive aggregation of particles of matter as they were formed, and (4) extremely rapid formation of elements, probably within the first half-hour of existence.

Interesting as these suggestions may be, they fail to answer one vital question: the source of

these various factors. Where did the free neutrons, protons, and electrons originate? What forces were at work to cause them to unite to form matter? Until these questions can be answered, we are no nearer an explanation of the origin of matter than before.

Not only is this true, but to add to the quandary, many stars fail to fit into the sequence of later events supposed to lead to the present composition of the universe. Hoyle has suggested that the heavier elements were formed in supernovae and then dispersed. Yet there are far too few of these to account for the heavier elements of our galaxy.

Several hypotheses have been put forward to account for the origin of the universe. The earliest one of consequence was proposed by the French mathematician Laplace, in 1795, and is known as the nebular hypothesis. Laplace imagined that a lenticular nebula once existed as a diffuse mass of incandescent gas, filling space beyond the present limits of the solar system. As it cooled and lost heat, it shrank in diameter, and condensed into rings. These rings consolidated to form the planets.

The nebular hypothesis involved so many problems that at present it is wholly untenable to astronomers, and they have looked elsewhere for an explanation of the origin of the solar system. In passing, it may be noted that spiral nebulae are still pointed out as evidence of some kind of a process similar to that postulated by Laplace. But the only real evidence is the shape of the nebulae, and there might be many explanations, therefore this characteristic is of no real value.

In 1904 the geologist T. C. Chamberlain and the astronomer F. R. Moulton presented the planetesimal hypothesis. Incandescent gas torn from the sun, they suggested, was cooled and congealed in outer space to form small particles, or planetesimals. In time many of these aggregated supposedly to form the present planets. This hypothesis met with so many difficulties that it is now regarded as worthless. Just to mention one difficulty: it fails to account for the composition of the earth, with its iron-nickel core and its mantle and crust of entirely different types of rocks.

A more recent suggestion is that scattered dust particles in space might have been acted on by light pressure from the stars and thus caused to congregate, eventually forming the sun. But this does not account for the origin of the dust particles nor the stars.

It is quite obvious as we study these various hypotheses that they all start with the assumption of some kind of particles, either material or

energy units, but none of them can explain how or where these particles came into existence. This is an inscrutable problem.

Different Origins of the Universe

At present two theories (better called hypotheses, as they have really not reached the status of true theories) are attracting considerable attention. One hypothesis is called the "point-source" theory, or more commonly the "big-bang" theory. Proponents assume sudden formation of the universe from a small mass. Supposedly, this mass has been expanding and as new bodies are formed, they race away from the center of the universe at a terrific rate. The other hypothesis, the "steady-state" theory, assumes that the universe is stationary. The red shift upon which the idea of an expanding universe is built, does not mean expansion, say the advocates of the steady-state theory. On the contrary, new matter is being created in outer space, and it is this new matter that gives the appearance of expansion. In 1948 Hoyle and others proposed that the rate of the supposed expansion is equal to the rate of the creation of new galaxies.

It is not at all difficult, upon examination of these hypotheses, to recognize that they rest on grounds that are equally as unstable as any others that have previously been proposed. The whole matter of cosmogony is simply a case of speculation, but so far all of these speculations remain at the hypothesis stage.

Quantum mechanics has reduced the properties of the atoms to energy relations between various factors such as gravitation, magnetism, etc. Thus modern physics has linked the existence of matter with energy. The work on atomic disintegration has modified the old concept of matter formed *ex nihilo* to creation of matter from energy.

This still leaves unanswered the question of the source of energy organized into matter. Is matter only an accidental organization, or did it require direction by an intelligent Creator? Anyone familiar with the complexity and the systematic organization of chemical compounds finds it extremely difficult to believe that it all came about accidentally.

And what about "free energy?" Can it exist without any source? As far as we know energy proceeds from some source; it does not exist free in space. And if it does have a source, or even if it did exist free, could it ever build up this complicated universe without intelligent direction? These are questions that scientists have been unable to answer to this date.

With all these hypotheses, how much nearer are we to the ultimate solution of the origin of

the earth and of the heavenly bodies? We have two approaches to the question—the Bible and imaginative speculation of scientists.

The Bible clearly declares the ultimate source of all being in the following words:

By the word of the Lord were the heavens made. . . . For he spake, and it was. (Psa. 33:6, 9)

For by him were all things created. . . . And by him all things consist. (Col. 1: 16, 17)

Upholding all things by the word of his power. (Heb. 1:3)

Here, instead of vague speculations, we have positive statements, in fact, the only positive statements on the subject. Revelation gives what scientific methods cannot possibly reveal. The declaration in Genesis 1:1 states a profound principle that scientists have neither been able to overthrow nor substitute with anything better, in spite of all the new knowledge of the universe brought forth in recent centuries.

Ancient Records of Time Considered

Thus far we have been considering the world in space, but now let us turn to the question of time. What about the time element in creation? Can we learn anything from scientific investigation, or is time as well as space to be understood only by accepting the revelation of the word of God?

Ancient records regarding time are vague and difficult to coordinate with scientific time scales. A few examples will demonstrate this.

Chinese legendary history goes back to 2,700 B.C., but authentic chronology dates only to 1,300 B.C. Therefore this does not help us any in determining the age of the earth.

Hindu history began in the third century B.C. Their scholars worked out a system of cycles of the heavenly bodies that would mark the beginning of all things. The date at which they arrived was 4,320,000 years ago. Obviously this is purely theoretical, and is of no aid in solving our problem.

Egyptian tradition and mythology make it impossible to recover much of prehistory in that land. The first dynasty, that of Menes, a traditional monarch, is given by the 1966 edition of the Encyclopedia Britannica as 3,100 B.C. This is much more recent than older chronologies of Egyptian dates, and is not far from acceptable creationist estimates.

Before the first dynasty the Paleolithic "period" is estimated to have dated back to about 4,500 B.C. This is based solely on the uniformitarian hypothesis, which assumes that Paleolithic man arose by slow stages from savagery. The time may have been much shorter. From the first to the twelfth dynasty the records are very frag-

mentary, and may be subject to more change than is generally acknowledged by archaeologists.

The early Egyptian dynasties were listed by Manetho, an Egyptian priest of about 300 B.C., who wrote an Egyptian history for Ptolemy I. Only fragmentary portions of his writings are to be found in Josephus and other writers. Some of the dynasties of upper and lower Egypt may have overlapped, and if so, the time would have been shortened.

Babylonian records begin about 2,000 B.C., which is well within Biblical historical times. The earliest Greek records date from about 1,250 B.C., and the Roman from about 750 B.C., therefore these are of no value in settling the problem of the age of the earth.

Time Based on Genesis

The only records on which accurate dating can be established is that found in Genesis 5 and 11. Archbishop Ussher followed the Masoretic text, and his dates were placed in the margin of the King James version of the Bible for many years. According to his calculations, creation took place 4004 B.C. Many conservative scholars today doubt that his calculations were completely accurate, and yet, it must be admitted that they do give an approximation. One other translation, the Septuagint, made in the third century B.C., gives longer lives to many of the patriarchs. If this were accepted, the date of creation would be set at about 5,000 B.C. Josephus lists the patriarchs and agrees with the Septuagint. Which of the two possible dates is correct, is a debated question.

As to time before creation week of Genesis One, there are no valid records of life upon the earth—nothing but speculation. Therefore the only time that the Christian can reasonably accept, *on the basis of written records*, lies somewhere between 4,000 and 5,000 B.C., if we are to avoid doing an injustice to the Genesis record. Only a few hundred years would be necessary to adjust these dates to the Egyptian chronology.

Of course geologists would not agree with this conclusion, for they think they have evidence from the rocks that the Genesis record is not dependable. But it must be pointed out that the theory of long geological ages is open to serious question, however, that problem is outside the scope of this article.

One problem we must recognize is that of the rise of the great empires of antiquity before the dawn of recorded history about the time of Abraham. Many have asked, how could such large nations develop in so short a time? In answer to that query let us point out that the human race was very prolific at that time, and

the natural death rate low; we must not think in terms of the present rate of population growth.

Thus, when we consider the rapid multiplication of people in the early years of earth history and look at the population of the United States within 300 years, we begin to realize that not so many thousands of years are required as are often assumed to have elapsed between the flood and the time of Abraham. True, Bronze Age is placed at about 2,100 B.C. to 1,500 B.C., and the stone ages are, by some archaeologists, dated as far back as 10,000 B.C. But, as we have stated, Christian scholars are not obligated to accept these dates as valid.

Other Questions of Time, Uniform Change

Another question has been raised by glaciologists. If, as seems evident, the ocean levels were raised by the melting of the great ice sheets, how can we correlate this with Biblical history? If we put the glacial period after the flood, would not the melting of the ice have flooded the seashores within historical times?

Two points should be kept in mind. First, the theory of multiple glaciations is being challenged by competent authorities, and specialists have seriously suggested that the first three glacial "periods" are only evidences from various phases of the one true glacial epoch, the Wisconsin. Then if we put the flood from 2,500 to possibly 3,000 B.C., we have a thousand years between then and the first seaport of which we have any knowledge, that of ancient Tyre. This problem is one that needs study, but there are possible solutions well within the time limits allowed by present understanding of the Biblical narrative.

A careful review of all the genealogies and chronologies of ancient times shows that the oldest and most complete record is found in the Bible. No one has been able to offer positive proof against the Genesis record and its time elements. It is true that we cannot pin the time down exactly, nevertheless we can be confident that the time of creation can be located within fairly close limits.

We realize that some creationists, while they totally reject the evolutionary theory, still maintain that creation must have taken place as much as 30,000 to 100,000 years ago, and some even suggest millions. But these views are no more tenable to the conservative creationist than are those of the evolutionists, as far as time is concerned. The chief problem of these theorists is that they feel that they must have more time than the Genesis record allows to account for all the geological changes that appear to have taken place between the flood and the beginning of written history.

These creationists confuse the issue when they try to account for geological changes on the basis of more or less uniform action. They may recognize that the flood was responsible for some geological changes, but fail to grasp the enormous proportions or the violence that must have continued afterwards for many hundreds of years. These persons might be designated as "stretch-time" creationists or "uniformitarian creationists." Their main problem is that they are thinking too much in terms of present rate of change. They believe in creation, but confuse the whole question of time because they cannot conceive of processes much different from what they now observe.

The problem of radioactive dating is discussed by other authors in this *Annual*. Therefore I will simply submit that the claims put forth in that

field are not very impressive since there are so many untested and untestable hypotheses at the basis of the methods involved.

In conclusion, what can we really know about the earth in space and time? As far as space is concerned, we know a great deal, for our knowledge of the universe has expanded tremendously within the last four hundred years. But with respect to time, we know absolutely nothing about the origin of the rest of the universe, since the Genesis record deals only with the creation of this earth, and scientists have offered nothing but vague and impossible hypotheses. We can therefore conclude that the Biblical record of creation of the earth only a few thousand years ago is still valid, for nothing that scientific investigation has brought to light can disprove that record.

IS THERE LIFE ON OTHER WORLDS? A CRITICAL REASSESSMENT OF THE EVIDENCE

FRANK W. COUSINS*

The case for life on other worlds is examined according to three hypotheses that are presently put forward, viz.

1. *That there are numerous planetary abodes for life in the Milky Way and in the extra-galactic nebulae.*
2. *That simple life came into being by a fortuitous assemblage of inorganic matter in the primeval oceans of the earth.*
3. *That life has evolved from a simple beginning on earth and that it will have proceeded in a similar fashion on the other hypothetical planets.*

Evidence on each of these three counts is shown to be unsatisfactory and the intellectual edifice one that is open to considerable doubt. The question of life on other worlds is seen to be an open one.

"There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact." (Mark Twain, *Life on the Mississippi*)

Prejudice in scientific matters is deeply ingrained and never more so than in the answers which are given to the question, Is there life on other worlds? Evidence for and against is meager and the answer is always an opinion, or assertion, not a statement of scientific fact.

Landing of men on the Moon has engendered a surge of rash speculation, with dogmatic statements through the mass media to the effect that the achievement is the greatest thing to have happened since "the fish stood up and walked out of the sea," and that the answer to extra-terrestrial life is at hand. But no one is

able to show, outside fiction, that the fish once stood up and walked or that the problem of extra-terrestrial life is near resolution.

The dogmatic approach to the question of life on other worlds, of which I complain, is best illustrated by two representative statements. Ian McDonald reported in *The Times* of London (8 August, 1969 from Washington) on the subject, "Mariner 7 Finds Clue to Life on Mars," as follows:

By coincidence, the Mariner findings came only a day after other scientists had found evidence of organic material potentially suitable for the spontaneous evolution of life, in two separate samples of Moon dust. (Emphasis added) (p. 1)

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And John Maynard Smith, a populariser of science writing in *The Listener* (London, 7 August, 1969), wrote:

There is a rather sick joke which has been going the rounds among scientists for some time now. *To understand it, you have to accept their assumption that since intelligent organisms have evolved on Earth, they have presumably evolved on thousands and perhaps millions of other planets in our galaxy.* Since many of the other planets must be much older than the Earth, one may suppose that many intelligent life forms have evolved long before man did. One then supposes that any intelligent organism, having reached intelligence, will start beaming out into the galaxy interesting messages about how they're getting on. If so, it is, of course, exceedingly puzzling that we have never yet picked up a message from any other planet. The suggested explanation is that as soon as some organism becomes intelligent, then, within a few hundred years, it manages to destroy itself. (Emphasis added) (p. 178)

The dogmatism of the popular approach is also found in more serious works. Firsoff¹ and Puccetti² for example attempt to clothe the case with some scientific covering. Puccetti analyzes three "candidates" for the role of persons other than human persons—the supercomputer, the organic artifact, and the extra-terrestrial being. The first of these he rejects since a true machine cannot have feelings, and is therefore not a moral agent. Organic artifacts he rules out for the reason that none exists as yet. The major part of his work is thus devoted to extra-terrestrial beings despite the fact that, as with organic artifacts, there is likewise no satisfactory evidence for this third alternative.

Puccetti takes the view from the start that evolution is the mode of animal genesis. On Mars for example he tells us, "the scarcity of oxygen and formidable temperature variations *limit evolution* to the simplest forms of life." (p. 59) In every case his appeal is to *evolution* of life. Four extracts will be sufficient to show the position:

(a) About 5 percent of all visible stars are both single-hence capable of providing stable planetary orbits—and of the right size to create "habitable" temperature zones for the spontaneous generation and *evolution* of life.

(b) The large early spectral types (O, B, A, and early F), with broad habitable zones, unfortunately evolve too quickly themselves for *biological evolution* to take place on whatever planets they might have.

(c) Even without sunlight, this internally produced energy should be sufficient for chem-

ical evolution and photosynthesis of a distinct sort. Thus life could be generated on such crusted stars and self-heating distant planets; and if so, why should not intelligent beings *evolve* there?

(d) About 5 percent of all single stars are of the right size to have planetary systems in which one or more planets would fall in the "habitable" temperature zone for long periods of time; and life could generate spontaneously and *evolve* into intelligent forms during that period of time by the same means as obtained on the surface of the Earth. (Emphases added in each extract.)

Firsoff builds a less erudite case than Puccetti. He fails in my view to distinguish between organic and inorganic evolution. He sees death as an expedient for further evolution, and puts the virus (without evidence) as evolutionarily late. Further he fails completely to understand the nature of mutations in the problem of evolution and asserts, but does not prove, "If any planet has surface conditions suitable, or at least tolerable to any terrestrial organisms life may be assumed to have developed there." (p. 58)

The case for life on other planets rests on three clearly separated hypothetical assumptions: (1) the existence of billions of planetary systems in the cosmos similar to our own solar system, (2) evolution of primary organisms from inorganic matter contained in a primaeval ocean which once covered our planet Earth and other planets with similar oceans in which life could have evolved, and (3) these simple organisms then evolved into complex organisms. Such an assembling of hypothesis upon hypothesis is intellectually unobjectionable provided the tenuity of the nexus in the argument is not lost sight of. Let us examine the validity of these hypothetical assumptions.

HYPOTHESIS I

That there are numerous planetary abodes for life in the Milky Way and in the extra-galactic nebulae.

The first hypothesis is a statistical abstraction which Shapley³ gives succinctly, on the basis of an initial guess in our own galaxy and then extrapolates to embrace the population of the extra-galactic nebulae out to the periphery of the known universe.

He asserts that there are more than 10^{20} stars, each one capable of maintaining photochemical reactions that are the basis of known terrestrial plant and animal life. He assumes at the very lowest that one star in a thousand possesses a planetary system. One in a thousand of these stars is assumed to possess a planet at the correct distance from the star to provide a suitable en-

vironment for terrestrial protoplasm. One in a thousand of the suitable planets is believed large enough to hold an atmosphere (undefined). Finally one in a thousand of these might have air and water which might allow naturally arising complex inorganic molecules to develop into organic molecules. He then summates these four separate one-in-a-thousand chances, each of which is an inspired guess, to obtain the answer that one star in 10^{12} meets his criteria.

Shapley then divides 10^{20} by 10^{12} and obtains the answer that there are 10^8 suitable systems in which conditions of the first hypothesis might exist. This arithmetical exercise appears dogmatic in that some latitude should be given to the assumptions made, thus arriving at a numerical range for the number of lifebearing planets, rather than a single number: 10^8 . This general weakness in scientific inference, exemplified in Shapley's reasoning, has been explored by A. W. F. Edwards⁴ Shapley's solitary figure of 10^8 is a guess and nothing more.

Another Estimate of Possible Planets

Professor Fred Hoyle engaged in this guessing game before Shapley. In 1949 he marshalled the supposed affirmative evidence for life elsewhere in the universe in a radio talk given over the British Broadcasting Third Programme network. He was keen to form the planetary systems from binary stellar systems in which one component is a supernova. (A supernova is a star which suddenly becomes very bright.) He imagined that this gave him an ingenious yardstick to work out the planetary systems in the cosmos. Hoyle stated that it is known from observation that supernovae occur in each galaxy of stars at the rate of one every 500 years. To our own galaxy he accords an age of 5×10^9 years hence 10^7 supernovae will have appeared and thus 10^7 planetary systems will have developed in the galaxy. There are 10^8 galaxies and thus $10^8 \times 10^7$ planetary systems (i.e. 10^{15}).

Professor Hoyle estimates (in contradiction to Shapley's 10^8) that there are 10^6 planetary systems suitable for life in our galaxy and hence 10^{14} planetary systems for life in the known cosmos. This unique planetary-forming idea of Hoyle has not been accepted, indeed the formation of our own solar system is still very much unresolved, and Hoyle^{5,6} personally rejected his own supernovae hypothesis. The interested reader may be referred with confidence to the recent erudite survey of the problem of the origin of the solar system by Williams and Cremin.⁷

We have then two estimates for the number of possible planets in the cosmos available to life [10^8 (Shapley), 10^{14} (Hoyle)]. Only one

is based on evidence (the rate of supernovae formation—Hoyle) and that evidence is now rejected by its author. It will be seen that figures of this nature must be treated with the greatest of caution and are not to be enthroned in the mind as facts.

Some Direct Evidence Itemized

Consider now the so-called direct evidence on the question of planetary bodies in the galaxy. In 1963 Dr. Van de Kamp reported the discovery of a new planet after his assiduous search of the heavens for 20 years. The "new" planet was not observed but only postulated from the dynamic aberrations of Barnard's Star B in its celestial path, which is out of the accepted uniform rectilinear motion.

Barnard's star had been photographed by Van de Kamp and his colleagues every year since 1938 to produce 2413 photographic plates from which it was possible to calculate the motion and distance of the star. On the assumption that Barnard's star has 15% of the Sun's mass, the companion is said to be one and a half times the mass of Jupiter. The broad question of the planetary companions of stars has been reviewed by Van de Kamp.⁸ The method of detection is one of long focus photographic astrometry and the calculation of the lower limit of the mass of the postulated unseen companion.

Other evidence to date for the existence of planetary companions is sparse. The possibility of a companion to the star 70 Ophiuchi and Krüger 60 has not been confirmed. Another spurious result is that of the postulated companion to the star Lalande 21185 derived by Mannino in 1951. Investigations concerning the stars Cincinnati 1244 and η Cassiopeia are not conclusive. An unseen companion of 0.016 solar mass is believed to exist about the well-known double star 61 Cygni.

The difficulties in labour, accuracy of observation and calculation are immense. Something of the difficulty is shown by Su Shu Huang.⁹ He records that

to detect the existence of a planet the size of Jupiter in a hypothetical Sun-Jupiter system at distance of ten parsecs* requires an ability to measure an astrometric angular deviation of 0.00005 seconds of arc or an ability to measure by spectroscopy a radial velocity correct to 0.01 Km/set or to measure by photometry a change in luminosity of 0.01 magnitude.

It should be kept clearly in mind that all variations in proper motions may not of necessity derive from an unseen companion of plane-

*Note: A parsec is approximately 19.8 million, million miles (19.8×10^{12} miles) or 3.26 light years.

tary mass, but that conversely all unseen companions whatever their nature will yield perturbations of some magnitude, though whether they will be observed or not is open to doubt. Firsoff¹⁰ makes this elementary mistake in his *Life, Mind, and Galaxies* by dogmatically equating dynamical anomalies with superplanets. The perturbing mass is unseen and no one can be certain on the point. To say that a superplanet is *discovered*, by such evidence, is hardly factual.

The argument concerning possible planetary companions to "near" stars is only a statistical abstraction since it makes no appeal to experimental evidence. In any statistical argument worthy of consideration the link with reality is the sample which is taken for the ground on which the edifice is to stand. In this argument no sample has been taken and none is yet within our skill. The numbers of planetary systems in our galaxy is unknown and there is therefore no firm ground on which to extrapolate in order to obtain a figure for the cosmos.

The one planetary system of which we have considerable data is the solar system in which the individual planetary environments are reasonably established. **The consensus is that there is no clear indication of life in the solar system other than on the Earth.**

In any planetary system, it would seem that conditions for the existence of life, as found on Earth, are critically limited. If the planet is too near its parent sun it will be too hot for life to exist; if it is too far away it will be too cold. If it is too large, it will have retained the gas hydrogen, and the intermediate state of oxidation characteristic of living organisms, of which we are familiar, would be maintained only under great difficulty for then CH₄, NH₃, H₂O and H₂S would be abundant compounds.

Until recent observations with space probes one might have included Venus as a possible site for life within the solar system, but it is now established the Venus is a hot dielectric sphere with mean thermometric temperatures of about 700°K.^{11,12} Even the polar regions are thought to be above the normal boiling point of water. The data from the successful Venus 4 spacecraft of the U.S.S.R. support these conclusions since the entry capsule recorded surface temperatures of 550°K near the equator on the night side. "The universe," says Eddington, "is anti-septic—either too hot or too cold." This dictum is not without support from our "local" environment in space.

HYPOTHESIS II

That simple life came into being by a fortuitous assemblage of inorganic matter in the primeval oceans of the earth.

The second hypothesis in the nexus of argu-

ment is expressed with erudition by Oparin.¹³ During the first quarter of this century there was little or no discussion on the nature and origins of life—a profound point for anyone interested in the philosophy of science.

An article by Haldane aroused a flicker of interest in 1929, but it was Oparin's *Origin of Life* published in 1937 which triggered off the many speculations of recent decades. His book of 1937 is still the best source of his general ideas, which have been augmented by the release in 1953 of the Dover edition with an erudite introduction by Serguis Margolis, Professor of Biochemistry at the University of Nebraska. A translation by Eleanor Maass from the Russian of Oparin's *Genesis of Evolutionary Development of Life* appeared in 1969 (Academic Press 1969), which is the 1937 book brought up to date. (Some inaccuracies in this later work have been noted, see *Nature*, 223: 103, 104, July 5, 1969.)

Oparin's Account

Oparin presents the story in several distinct stages. He forms the Earth out of the Sun's atmosphere on the now discredited theory of Jeans. He then asserts that carbon appeared first on the Earth's surface, not in the oxidized form of carbon dioxide but in the reduced state in the form of hydrocarbons, and asserts that nitrogen also appeared first in its reduced state in the form of ammonia. He next postulates coazervation* in the helter-skelter accumulation of moving particles to obtain varying concentrations at different points of the aqueous medium.

He finds difficulty in explaining the exceptional energetic activity of enzymes and pathways for the appearance of such a perfect apparatus in the living cell (p. 168).¹⁴ To overcome this difficulty he appeals to natural selection but does not detail how the selective "intelligence" operates in inanimate structures (p. 175). In this manner (p. 195) he produces "the simplest primary organisms" and with their appearance the question of the origin of life on Earth is in his view closed since to use his own words "what follows now is a history of the *evolution* of living creatures." He admits, however, that "unfortunately the problem of the origin of the cell is perhaps the most obscure point in the whole study of the evolution of organisms."

More recently this question has been examined by Professor J. D. Bernal,¹⁵ one of the world's most distinguished crystallographers. The unusual scientific nature of the case is expressed in his own words:

We are here trying to settle a question of a

*Coazervation is the separation of a lyophilic colloidal sol into two liquid phases. A lyophilic colloid is one which is readily dispersed in a suitable medium.

different character from those of the rest of science; it is not merely a description but an attempt to carry out an intellectual reconstruction based on assumptions of inner logic themselves drawn from experimental science here and now.

The inner logic follows some curious pathways since Professor Bernal expresses his dislike of the philosophical emptiness of special creation yet accepts it as axiomatic that life arose on the surface of the Earth. He departs from Oparin's views decisively in thinking that cells are a late stage in the process, preceded by about 2,000 million years of chemical evolution of macromolecules in "sub-vital areas" not defined by membranous boundaries.

Bernal is unable to explain, except by chance, how the key phenomenon of molecular self-replication arose in the course of chemical evolution. As with Oparin, once the intellectual schema has produced the cell from molecules and the molecules from organelles his story is combined with the theory of transformism to be found elsewhere in the literature on natural history.

One is left with the feeling that, provided the premises are carefully laid in this field of assertion, opinion, and guesswork, the desired answer is not too difficult to reach.

Both Oparin and Bernal allow evolutionary concepts to enter their reasoning which then ceases to be exact. They both require unlimited time for the creation of organisms (the reader may reflect that the supposed reduction of the toe number in *Eohippus*—the alleged progenitor of the parade horse of today—is said to require 60×10^6 years), especially for their further evolution to occur, yet time *per se* achieves nothing, and they are compelled from the start to break the rapid synthesis of organic matter. Even chemical processes become evolutionary, in spite of the fact that at present they are repeated nearly instantaneously in any terrestrial laboratory.

Professor C. D. Darlington¹⁶ has spoken of "Galactic Life." He is more qualified than most to indulge his imagination. Actually he does little more than invite us to follow what we now know to be completely unproven, namely the build-up of a widely diversified set of living things on chance mutations.*

*Emile Guyenot has said mutations are powerless to explain the general adaptation which is based on organization. It is impossible to produce the world of life where the dominant note is functional organization, correlated variation and progression, from a series of random events. Further it runs counter to Boltzmann's elegant formulation of the Second Law of Thermodynamics: "the logarithm of the probability of a state is proportional to the entropy of that state."

An Experiment and Critiques

More recently still we have news of what is called the Kornberg Experiment. Dr. Arthur Kornberg, a Nobel prize-man, has with complete success conducted in the laboratory one of the key replication processes to which Professor Bernal refers in his hypothesis. In the experiment "Natural" DNA (the multi-unit compound which forms the stuff of the chromosomes) and the appropriate enzymes were made to combine, in the right order, with a set of primary building blocks provided by Kornberg. In this way a DNA molecule was produced, identical with the parent.

It has been widely held that this is the creation of new life in the test tube. It is in fact, not the creation of new life, but a persuading of life to act as the template to produce outside the living cell a replication process. The experiment is one of considerable elegance, but it is clearly to be noted that it offers no help in the understanding of the *origin* of life since it is a cascade experiment in which life has to be present *ab initio* before the experiment is able to proceed.

There are immense difficulties involved. Professor Barry Commoner¹⁷ (the Watson-Crick critic) offers the most erudite attack in his critical article which ends with this powerful and profound thought:

Biologists have confronted succesively—like a nest of Chinese boxes—levels of complexity ranging from the ecosystem to the internal chemistry of the cell. The last box has now been opened. According to the Watson-Crick theory, it should have contained the single source of all the inherited specificity of living organisms—DNA. It is my view that we now know that the last box is empty and that the inherited specificity of life is derived from nothing less than life itself.

The philosophical problems in these fields are most cogently expressed by Professor M. Polanyi in his "Life Transcending Physics & Chemistry," *Chemical & Engineering News*, Aug. 21, 1967, which shows *inter alia* that coded information is not open to chemical and physical methods of investigation. He offers as an illustration of this profound point the following analogy:

A book or any other object bearing a pattern that communicates information is essentially irreducible to physics and chemistry. It would follow that we must refuse to regard the pattern by which DNA spreads information as part of its chemical properties.

These matters are more fully investigated in his essays *Knowing and Being* (London, 1969).

Criticisms from Mathematicians

Let us turn from biologists to mathematicians since there seems little opportunity to get any direct evidence from the biologists. In this change of disciplines we may find with Arbuthnot, "that mathematics are friends in as much as they charm the passions, restrain the impetuosity of imagination and purge the mind from prejudice."

Charles Eugene Guye, a Swiss mathematician has calculated the chances of manufacturing a single molecule of some protein-like substance and also the quantity of material to be mixed in the experiment. The odds come out at 100^{160} to 1 against, with the quantity of material to produce one molecule larger than that in the known universe, sextillion sextillion sextillion times in excess.

The calculation for the time involved for the experiment to have taken place on Earth is 10^{243} years which is an interesting figure to compare with the present estimate of the Earth's age of 4×10^9 years. Proteins are very individual substances and the long chains linked by the amino acids cannot be combined in any way one chooses, indeed the wrong order of assembly may cause them to be inimical to life. It has been calculated that links in the chain of a single protein may be put together in 10^{48} different ways. Even according to the usual uniformitarian assumptions, the Earth has been cool enough to accommodate life for only about 10^{15} seconds. We may marvel at the speed with which chance would have to operate to show even a small measure of success.

Now comes the most recent mathematical "boulder" to be cast into the evolutionist's pond, and the ripples are likely to be wide and persistent provided the event does not fall beneath the notice of astronomers and biologists. F. B. Salisbury¹⁸ calculates that,

A typical small protein might contain about 300 amino-acids, and its controlling gene about 1,000 nucleotides (three for each amino-acid). Because each nucleotide in a chain represents one of four possibilities, the number of different kinds of chains is equal to the number 4 to the power of the number of links in the chain; that is, $4^{1,000}$, or about 10^{600} .

Imagine that the primeval ocean was uniformly 2km deep, covering the entire Earth, containing DNA at a concentration of 0.001 M (about 700 g of DNA/l. of solution), each double stranded molecule with 1,000 nucleotide pairs. Also imagine that each DNA molecule reproduces itself one million times per second, a single nucleotide substitution (a mutation) occurs each time a molecule repro-

duces, and no two DNA molecules are ever alike.

In four billion years, 7.74×10^{64} different kinds of DNA molecules will be produced. On 10^{20} similar planets in the Universe, this would be 7.74×10^{84} (say 10^{85}) different molecules. If only one DNA molecule were suitable for our act of natural selection, the chances of producing it in these conditions are $10^{85} / 10^{600}$ or only 10^{-515} .

If 10^{100} different kinds of molecules could each carry out the necessary precursor synthesis, this is equivalent to saying that 166 of the nucleotides might be changed without loss in ultimate activity of the enzyme. Still, only one molecule out of ever 10^{500} would be acceptable, and after four billion years on 10^{20} planets, 10^{415} of the first 10^{500} possibilities remain to be synthesized.

The chances are, then, still unimaginably small (10^{-415}) that a proper DNA molecule would be produced in this time. And if the proper molecule did appear by that fantastic accident, the problem comes up again the next time a precursor becomes limiting.

In the 2km deep oceans on the 10^{20} planets during the 4×10^{12} years, the DNA chain can have only 141 nucleotides if all 10^{85} possible kinds are to be produced. This would code a protein chain only forty-seven amino-acids long.

The point of these numbers is that one DNA chain 1,000 nucleotides long can be a unique individual in a population of 10^{600} other unique individuals. Numbers of this size have no precedent in anything but the concepts of information theory. Assume, for example, a cubic universe with dimensions of 20 billion light years on each side. In Angstroms, this would be about 10^{39} Å on a side, with a volume of "only" 10^{117} Å³. Imagine the number of universes required to contain 10^{600} tightly-packed DNA molecules!

In spite of the wild assumptions, the problem should be apparent. In the evolution of life on Earth, we are dealing with millions of different life forms, each based on many genes. Yet the mutational mechanism as presently imagined could fall short by hundreds of orders of magnitude of producing, in a mere four billion years, even a single required gene.

To compound the problem, consider the fantastic information content of a nucleus. The DNA in man contains about 10^9 nucleotide pairs per nucleus (other organisms from 10^7 to 10^{11} pairs^{11,12}). Written in standard type, this would occupy about 1,000 volumes (10^9 bits, 2,000 bits/page, 500 pages/volume). Britten and Kohne have shown that certain DNA

sequences of higher organisms recur anywhere from a thousand to a million times per cell. Hence much is redundant. Work on amino-acid sequences within a given protein also implies a high redundancy. Yet if only one tenth of the genome in man is relevant, that is still 10^8 bits of information (100 volumes). Could the mutation process account for it? . . .

Special creation or a directed evolution would solve the problem of the complexity of the gene, but such an idea has little scientific value in the sense of suggesting experiments.

Finally, we do not know how life began but the concept that life evolved from non-life is widely believed as a logical extension of the theory of evolution. Oparin¹⁹ must not be misunderstood here since he has stated with great clarity that

The peculiarity which distinguishes life qualitatively from all other forms of motion matter . . . is that, in the living body, the many tens and hundreds of thousands of individual chemical reactions which, in their sum, make up the metabolism, are not only strictly co-ordinated in time and space . . . but the whole of this sequence is directed in an orderly way towards the continual self-preservation and self-reproduction of the living body as a whole.

The problem has been extensively studied more recently in the scholarly work, *The Origins of Prebiological Systems and Their Molecular Matrices*, edited by S. W. Fox, (Academic Press, 1965) which has been subjected to a revealing criticism in a masterly "Essay Review" in *Chemistry & Industry*, 1966 by Dr. T. L. V. Ulbricht. He reported that:

. . . at this Conference, Bernal posed a number of awkward questions. Here is one of them: "Which of the various synthetic studies that have been made of the formation of elementary molecular compounds is relevant to the question of the origin of life?" This can be considered in conjunction with Lipmann's comment: "That one finds such compounds (amino-acids, for example, in the experiments mentioned) doesn't tell us that this is a process really related to the origin of life. It means only that what the living organism does effectively in an organised way, can ineffectively be done in an unorganized way outside the living organism. . . .

He tells us,

. . . it was in the discussion of Fox's paper on the thermal synthesis of amino-acids at 1000°C that the most heat was generated. Sagan criticised this work as irrelevant, because of the high temperature used and of the necessity of absorbing the products in

water before they are decomposed at the same temperature. Fox believes that volcanic regions could have provided the high temperatures required and that rain would save the products from decomposition. When the critics were not convinced he said "the premise that it does not rain on volcanoes cannot be defended. . . .

Dr. Ulbricht goes on to explain that

. . . any replicative system we can conceive would appear to require the existence of ordered polymers. The formation of such polymers and of primitive enzymes is usually ascribed to "prebiological natural selection," i.e., an extension of the concepts of evolution to the world of molecules. This was strongly criticised at this conference by Dobzhansky, and by Mora, who regards "prebiological natural selection" as a contradiction in terms. "Molecules are supposed to have accurate and persistent self-copy ability, sufficient to resist randomisation and yet to have a moderate mutability rate, leading to the 'evolution' of the first self-reproductive system," which seems extraordinarily improbable because, as Mora says elsewhere, you cannot get more order out of a system than you put in. (pp. 43-45)

This brings me to the third hypothesis.

HYPOTHESIS III

That life has evolved from a simple beginning on earth and that it will have proceeded in a similar fashion on the other hypothetical planets.

We have seen that those persons who argue for life on other worlds always appeal to evolution as the *modus operandi*: let me repeat my extract from Professor Puccetti's writings:

Remember that we have established only two things: (1) that about 5 per cent of all single stars are of the right size to have planetary systems in which one or more planets would fall in the "habitable" temperature zone for long periods of time; and (2) that life could generate spontaneously and *evolve* into intelligent forms during that period of time by the same means as obtained on the surface of the Earth. (Emphasis added)

How realistic is it to advance the case for extra-terrestrial life in this way? It would have some validity if it could be shown first that evolution has occurred on the planet Earth. Many biologists and the greater part of the informed lay public accept evolution as a fact. But we should not neglect to examine the matter carefully. Universal acceptance is no substitute for evidence. Anyone familiar with Schopen-

hauer's stratagems²⁰ will recall his eternally valid warning:

But to speak seriously, the universality of an opinion is no proof, nay, it is not even a probability, that the opinion is right.

Professor Polanyi in his recent illuminating essays²¹ invites us to consider the "impatience with which most biologists set aside today all the difficulties of the current selectionist theory of evolution because no other explanation than that accepted as scientific appears conceivable. This kind of argument based on the absence of any alternative that is accepted as scientific may be valid, but it seems to me the most dangerous application of scientific authority." Professor H. Nilsson in his vast work, *Synthetische Artbildung*, 1953 goes further and claims that a slavish acceptance of Darwinian evolution prevents development of a proper system of biology.

In his recent article referred to above Salisbury points out:

Modern biology is faced with two ideas which seem to me to be quite incompatible with each other. One is the concept of evolution by natural selection of adaptive genes that are originally produced by random mutations. The other is the concept of the gene as part of a molecule of DNA, each gene being unique in the order of arrangement of its nucleotides. If life really depends on each gene being as unique as it appears to be, then it is too unique to come into being by chance mutations. There will be nothing for natural selection to act on.

The problem was discussed at a symposium of mathematicians and biologists in 1966; but they failed to solve the difficulty. I feel that virtually no one present except Eden and Schutzenberger, who outlined the problem, really understood what the commotion was all about. Some years ago I also outlined the problem. My outline begins by overstating the case somewhat, but it provides a background for discussion of modern discoveries which may be pointing toward a solution. I believe that the solution remains to be found.

No Textbook Explains Diversity

Let no one be deluded on this point. There is no textbook to my knowledge which offers even a plausible explanation of the multitudinous diversification of the animal kingdom on the transformist (evolutionary) model. Two books at opposite poles of the intellectual axis offer a ready test. I refer to the classic, erudite, and expensive work of Professor E. Mayr, *Animal Species and Evolution* (Harvard University Press, 1963), and the cheap *haute vulgarization* by J. Maynard Smith, *The Theory of Evolution*

(Penguin Book, Second Edition, 1966). The reader will search both books in vain for a satisfactory answer, yet they are widely read and quoted.

That the universal acceptance of the Darwinian position is open to challenge is found in Dr. Marjorie Greene's essay "The Faith of Darwinism":

... great new inventions, new ideas of living, which arise with startling suddenness, proliferate in a variety of directions, yet persist with fundamental constancy—as in Darwinian terms they would have no reason in the world to do. Neither the origin and persistence of great new modes of life—photosynthesis, breathing, thinking—nor all the intricate and co-ordinated changes needed to support them, are explained or even made conceivable on the Darwinian view.

And if one returns to read the *Origin* with these criticisms in mind, one finds, indeed, that for all the brilliance of its hypotheses piled on hypotheses, for all the splendid simplicity of the "mechanism" by which it "explains" so many and so varied phenomena, it simply is not about the origin of species, let alone of the great orders and classes and phyla, at all. Its argument moves in a different direction altogether, in the direction of minute specialised adaptations, which lead, unless to extinction, nowhere. And the same is true of the whole immense and infinitely ingenious mountain of work by present-day Darwinians: *c'est magnifique, mais ce n'est pas la guerre!*

That the colour of moths or snails or the bloom on the castor bean stem are "explained" by mutation and natural selection is very likely; but how from single-celled (and for that matter from inanimate) ancestors there came to be castor beans and moths and snails, and how from these there emerged llamas and hedgehogs and lions and apes—and men—that is a question which neo-Darwinian theory simply leaves unasked. With infinite ingenuity it elaborates the microscopic conditions for such macroscopic occurrences; but it provides no conceptual framework in terms of which they can be admitted to exist, let alone an "explanation" of their descent from "lower" forms.

Moreover, evolutionists sceptical of the neo-Darwinian synthesis have themselves empirical evidence to support their doubts. For despite the neo-Darwinians' claims, two great biological disciplines, paleontology and embryology, appear to lend their chief weight against the selectionist dogma.²²

That the evidence from palaeontology was inimical to evolution was advanced as early as

1914 in Spenger's great philosophical work "The Decline of the West." In volume two he states,

There is no more conclusive refutation of Darwinism than that furnished by palaeontology. Simple probability indicates that fossil hoards can only be test samples. Each sample, then, should represent a different stage of evolution, and there ought to be merely "transitional" types, no definition and no species. Instead of this we find perfectly stable and unaltered forms persevering through long ages, forms that have not developed themselves on the fitness principle, but *appear suddenly and at once in their definitive shape*; that do not thereafter evolve towards better adaptation, but become rarer and finally disappear, while quite different forms crop up again. What unfolds itself, is ever-increasing richness of form, is the great classes and kinds of living beings which *exist aboriginally and exist still, without transition types*, in the groupings of to-day.

Is There Extra-terrestrial Life?

The supposedly direct evidence available is that gathered from a study of 20 carbonaceous chondrites that have fallen on the Earth. The main evidence comes from two of these meteoritic stones.²³ A review of the position has been given by Hutchinson *et al.*²⁴ The evidence is controversial and turns on the so-called "organised elements" which may be terrestrial contaminants. The research work leaves much to be desired and cannot be accepted as conclusive.²⁵

Anyone who has followed me this far will see that we are faced not only with a scientific case but a philosophical one.

Conclusion

The question, Is there life on other worlds?, is an open one. We have no indubitable knowledge concerning it. The three hypotheses presently put forward for an affirmative answer are shown to have no firm foundations.

The evidence available incontrovertibly shows that there is life on Earth and that the solar system is mainly hostile to it. How life arrived and flourished on Earth is a question open to a considerable controversy.

The most frequently advanced answer today, in which evolutionary forces are appealed to, is one of scientific prejudice since the available evidence when viewed dispassionately shows a leavening element of mystery coupled with the

arrival of complex life *per saltum* in a manner compatible with creation. In such a situation demanding the exercise of humility we may close with Melville's powerful lines from "Clarel:"

But how if Nature vetoes all Her commentators:
Disenchant Thy heart. Look round!

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ARE THERE CORPOREAL LIVING BEINGS OUTSIDE THE EARTH?

HAROLD ARMSTRONG*

The question, whether there are corporeal living beings elsewhere than on the Earth, is investigated with the help of information both from observation and from Scripture. Within the solar system, the evidence from observation alone shows fairly conclusively that there is no extra-terrestrial life. Beyond the solar system, observation provides little evidence one way or the other. Scripture, however, and especially certain parts dealing with concepts of the fall and redemption, provides strong evidence to show that there are no rational corporeal living beings outside the Earth. And, again on grounds of Scripture, it is suggested that if there are no rational beings, then there are likewise no irrational beings.

The question mentioned in the title is one that is often heard today. Indeed, it is often heard without the qualification "corporeal," but it is necessary for us. For many Christians might not be especially surprised if someone should find angels "up there;" yet, it is not angels that many people have in mind when they raise the question.

The present purpose is to investigate the question, using whatever information may be obtained, 1. from general considerations, 2. from scientific observations, and 3. from Scriptural considerations. We include Scripture on the belief that it is a valid source of information, since it is ". . . profitable for doctrine . . ."¹ (the Greek word translated "doctrine" could also be rendered "teaching" or "education").

It is true that sincere men can differ about interpretations; but, then, the same could be said about the evidence arising from scientific observation.

In anticipation, it may be said that evidence from sources other than Scripture is quite inconclusive. The answer derived from Scripture seems to be: "No"; but it must be admitted again that some people may arrive at different interpretations.

1. General Considerations

Let us, then, consider some of the arguments, and first those which arise from general considerations.

It is often said that out of so many (assumed) planets around the various stars, there must be more than one with living beings. But back of this is an unproven assumption. It must be supposed, either that other planets, like the Earth, were created to be inhabited, or else that living beings will somehow "arise" wherever there are favorable, or not too unfavorable, conditions.

But there seems to be no evidence in Scripture (the only possible source) for the first supposition; and observation and investigation really gives no support to the second. In fact, some

recent arguments lead to the opposite conclusions. An article estimates that in four billion years, on 10^{20} planets, the chance is only one in 10^{415} that a molecule of DNA would be produced "by chance," on the basis of some reasonable assumptions.²

Another estimate, quoted in the same article, makes the probability of producing life by chance on the Earth in two billion years about one in 10^{225} . So if life arose "by chance here, it well might be something unique. If on the other hand, it came about by design, well then, in order to discuss the matter we must know what the Designer intended. And clearly a designer could do something just once, if he so chose; there was but one Parthenon.**

2. Scientific Observations

As for scientific evidence, the solar system seems to show that there are no living beings (let us understand "corporeal" henceforth), elsewhere than on the Earth. Recent visits to the Moon have failed to reveal any traces of even the most rudimentary living beings. (Many of the explorations which will be mentioned are recent, and well known; thus no particular references may be given concerning them.)

Not only have the rockets which have traveled close to Mars sent back nothing that could be taken as evidence of living beings; but also, the more information accumulated about conditions on that planet, the less likely it seems that anything could live there.³ As for the seasonal

**Editor's Note: It is hard even for an evolutionist like Dr. George G. Simpson to imagine seriously that intelligent life has evolved anywhere else, even though millions of other earth-like planets may exist. He concluded, in part, his 1964 paper entitled, "The Non-prevalence of Humanoids"- (*Science*, 143 (3608): 769-775). "There are certainly no humanoids elsewhere in our solar system." (p. 774) If life does exist in any other planetary systems, Simpson asserts, "It is extremely improbable that such forms of life include humanoids, and apparently as near impossible as does not matter that we could ever communicate with them in a meaningful and useful way if they did exist." (p. 775) Simpson's plea to scientists is embodied in his subtitle which reads, "We can learn more about life from terrestrial forms than we can from hypothetical extraterrestrial forms." (p. 769)

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changes of colour, which were once thought to be from vegetation, it now seems likely that they come from some inorganic cause.

Information about Venus is still scanty, since only the top of the heavy layer of clouds is visible. But again, every new piece of evidence makes the presence of living beings there seem less likely.⁴ The temperature, it appears, is high, well above the boiling point of water. Composition of the atmosphere is not at all favourable; in particular, there is little oxygen. Venus appears to be a hot, rather dry, barren planet.

The possibility of life, anything like what we know, on the other planets of the solar system is too small to call for any long discussion. Mercury is far too hot, and has no air or water. Other planets are too cold, and have highly unsuitable atmospheres. (It seems somewhat uncertain how much atmosphere Pluto has; but certainly it is too cold.) And the satellites and asteroids are all unsuitable for one or more of the reasons already mentioned.

The living beings under discussion (if there be any), are assumed to be somewhat like those which we know on Earth; and, in particular, to depend on the same elements and to have the same kind of chemistry. This means that they would need water, and would be restricted to temperatures (at the widest possible range), between the freezing and boiling points of water.

(This statement may need some qualification. Certainly creatures live in winter at temperatures below the freezing point. But they depend, eventually, on things that grew when or where the temperature was above freezing. If the whole planet were below the freezing point all the time, it is hard to see how beings could long live on it.)

And living things need oxygen, nitrogen, and certain other elements. And presumably they depend on photosynthesis by some of their members, and thus need suitable light. Yet, as has been pointed out, all of the planets, satellites, and asteroids, except the Earth, seem to be deficient in one or more of these respects.

One can, of course, imagine something at least analogous to life, depending on different elements and thus capable of existing under different conditions. But we have never seen anything of the sort; we know nothing about it; such "life" is like the "unknown somewhat" which philosophers used to suggest, and intelligent discussion of it is equally impossible.

One might, indeed, assume something more specific, e.g., beings in which silicon replaces carbon, or fluorine replaces oxygen. It might be worth while to undertake a separate discussion of such notions. Here, though, it can be remarked that the more we learn about the com-

plexity of living beings, the less likely such imitations seem. Probably no one seriously believes that there are structures like DNA made with silicon or fluorine; and without DNA, according to the common opinion, there would be nothing even analogous to living beings as we know them.

Observations Beyond Solar System

Now that the solar system has been considered, what can be said about more distant places?

The more distant places which we can see are the stars. Presumably no one has supposed that there might be living beings on the stars themselves; but it has often been suggested that some of the stars might have planets, and that there might be living beings on some of those planets.

The supposed planets, of course, have never been seen. They are far too small. A planet the size of the Earth, for instance, ten light-years away (and that would be close, as distances go among the stars), would subtend an angle of about 8×10^{-9} degrees; it would be in the same situation, as far as visibility goes, as a green pea about 28,000 miles away. Even if it were not too small, the planet would still be lost in the light of the star. For example, the planets Mercury and Venus are in the sky for the most part in the day time, when the Sun is well above the horizon; but of course they can not be seen.

On the other hand, there certainly are double and multiple stars; so it is not hard to believe that, as well as large and luminous companions, some stars might have small and dark ones. Indeed, there is some evidence that some stars have such companions.⁵

Double or multiple stars are distinguished and identified in various ways. If the members are far enough apart, and bright enough, they can be seen separately, and seen to revolve around a common point, the centre of gravity of the system. If they are too close together, in proportion to their distance from us, to be seen separately, but are both (or all), fairly bright, their motion around the centre can be shown by the Doppler effect.

(As the stars revolve, alternately approaching and receding, the frequency and wavelength of the light, which we receive from them, changes somewhat; just as the pitch of a train whistle seems to change according as whether it is approaching or receding. Many double stars have been identified and investigated in this way.)

Again, if two stars cannot be seen separately, and one is darker than the other but not small, the dark one may make its presence known by eclipsing the other from time to time,⁶

Problems of Planet Detection

If the companion is small and dark all these methods fail. There is, however, another possibility.⁷ Not only would the star attract the planets (if any), which revolve around it, but also the planets attract the star. Thus the star "wobbles" slightly, first one way and then the other, as the planet revolves.

In fact, it could be said in some rough sort of way that they all revolve about the common centre of gravity. (If there are more than two bodies involved, the motion can be rather complicated; but this statement is enough for the present argument.) The common centre of gravity may well lie within the star, but not quite at its centre.

In the solar system, for instance, Jupiter, with a mass about one thousandth that of the Sun, and an orbit of radius about 480,000,000 miles, would have the greatest effect. In the absence of effects due to the other planets, Jupiter and the Sun would revolve about their common centre of gravity, which would be about 480,000 miles from the centre of the Sun, near its surface, making one revolution in about 12 years.

The Earth, with a mass about one three hundred thousandth that of the Sun, and about 93,000,000 miles from the Sun, has less effect. If there were no effect from the other planets, the Earth and the Sun would revolve about their common centre of gravity, about 280 miles from the centre of the Sun, going around, of course, once in a year.

Thus the effect of Jupiter would make the Sun wobble over a total extent of about 960,000 miles, about its diameter. The Earth, by itself, would make the Sun wobble over a total extent of about 560 miles, less than one thousandth of its diameter.

The wobbling might either be observed directly, or possibly detected by the Doppler effect. at a distance of 10 light-years, the effect of Jupiter on the Sun, calculated above, would make the Sun seem to wobble by about 9×10^{-7} degree; the effect of the Earth, from what was said, would be only about one thousandth as much. The velocity of the Sun, in its wobbling due to Jupiter, would average 960,000 miles in 6 years, or about 5×10^{-3} miles per second.

Since the velocity of light is about 186,000 miles per second, the Doppler effect, due to Jupiter, would shift the wavelength, and the frequency, of the light by about one part in forty million. The effect of the Earth, (in the absence of other effects), would be only about one per cent of that. Thus it appears that the wobbling of a star, due to a planet accompanying it, could be detected in some cases, but it would need to be a quite large planet.

Supposed Life on Speculated Planets

Now from time to time such wobbling is, in fact, detected on the part of certain stars. So it appears that some stars have, indeed, a planet or planets. As was already mentioned, though, the larger a planet is the more likely it is to be detected.

Therefore, as far as we can tell from what we see here in the solar system, a large planet is not likely to be a suitable home for living beings; (a) the atmospheres are all wrong, (b) there is too much of such gases as methane and ammonia, and (c) too little of the gases which living beings need. So it might be said that the more likely a distant planet is to be discovered, the less likely it is to be a suitable home for living beings.

Sometimes it is supposed that, given a star and any arrangement, (or disarrangement!) of bodies around it, there would be a system which might serve as a home for living beings. Thus, it seemed to follow, such systems might easily come about by accident, almost.

It has recently been argued, however, that there are many regularities, such as "resonances," relations between the periods in the solar system.⁸ The probability, it was estimated, that all these regularities would come about by chance was no more than about one in 10^{10} . So systems like ours might be rather rare; ours might even be unique.

At first sight, it might seem that these regularities would have nothing to do with the suitability of the system, or some parts of it, as a home for living beings. But one should not be too hasty here; certainly the disposition of the system has something to do with its suitability as a home of living things. For instance, if Mercury, Venus, Earth, and Mars were where Jupiter, Saturn, Uranus, and Neptune are, and vice versa, our system would not be suitable for living beings anywhere.

The wobbling of a star, of course, tells us nothing about the chemical composition of the planet that causes it to wobble. The stars themselves vary widely in composition, as has been determined by spectroscopy.⁹ Even in the solar system, with one Sun, there is a great variation among the planets. So it seems likely that planets belonging to different stars might differ widely in composition.

It is widely supposed that the different kinds of stars are simply different stages of development from more or less the same beginning.¹⁰ But even if that is so it proves nothing about the planets, unless also we assume that the planets were formed at the same stage during the development of each star.

Again, the planets which we can observe, viz.:

those of our system, certainly differ in composition, and the differences seem to be as permanent as the planets themselves. So it is possible that the stars have differed from the beginning.

In any event, differences in a star, even if they be only differences in the stage of development, might easily spoil any planets around that star as a home for living beings. Planets around a red giant star, e.g., might not receive the proper radiation necessary for photosynthesis. And other stars, much different from the Sun, might cause other unfavourable conditions.

While there is some evidence to show that certain stars may have planets of some sort, there is no evidence to show that any such planets would be suitable as homes for living beings. In particular, it certainly should not be assumed that any planet, which should be at the right distance from its star to have a suitable temperature, is sure to be suitable for living beings in all other respects.

Scripture Considerations

Those of us who believe seriously in Scripture must inquire whether there is anything there which might throw any light on the question under discussion. Some have thought that Scripture does, indeed, contain hints of living (and rational), beings on other planets.

For instance, the "other sheep, which are not of this fold."¹¹ However, if the other folds are planets around other stars, it is hard to see how they and this Earth could be consolidated into "one fold." It seems easier, and indeed more common, to suppose that "the other sheep" were the Gentiles. Or they might have been people in the New World; or the lost tribes, in view of Ezekiel 34: 11-31, and 37:15-28.

There seems to be nothing in the account of Creation which tells us anything about the matter; the fact that the stars were created "for signs, and for seasons, and for days, and for years"¹² perhaps does not necessarily preclude other uses.

If "all flesh,"¹³ in the account of the flood means all, everywhere, there seems to be no notion of corporeal beings elsewhere than upon the Earth.

Again, there are passages such as: "The heavens, even the heavens, are the Lord's but the Earth hath He given to the children of men."¹⁴ But it seems to be in the New Testament that we shall find most of the evidence, and it may be presented in the following formulation.

The whole universe, in some sense, needs redemption. "The whole creation groaneth and travaileth together in pain until now."¹⁵ Moreover, this state of affairs is the result of Adam's

fall. ". . . by one man sin entered into the world, and death by sin."¹⁶ (In the Greek, "world" is "cosmos").

Now if the universe was made for Adam and his descendants, such a state of affairs can be understood; but if there be, on other planets, other races of beings, who never had anything to do with Adam, it is hard to see how his fall would have affected them. And if not them, surely not the whole universe, in which they would presumably have as much of a share as we.

But it is also hard to believe that there is, somewhere, a race which, never having had anything to do with Adam, has not fallen. This situation was suggested, I do not know how seriously, in stories by C. S. Lewis.) But "the whole creation groaneth," and ". . . there is none righteous: no, not one."¹⁷ So if there are any rational beings elsewhere in the universe, they need salvation, even as we do.

Importance of Salvation on Earth

Now any salvation must be through the Son, for "there is none other name under heaven given among men whereby we must be saved,"¹⁸ and ". . . it pleased the Father . . . by Him to reconcile all things unto Himself . . ."¹⁹ Moreover, it was through His death, for ". . . without shedding of blood is no remission. . ."²⁰

However, the Son did not shed His blood on each of untold myriads of planets, for "Christ was once offered to bear the sins of many,"²¹ and ". . . Christ being raised from the dead dieth no more, death hath no more dominion over Him. For in that He died, He died unto sin once. . ."²²

If, on the other hand, there should be any fallen beings somewhere on other planets, it does not seem that God would just leave them utterly to their doom, for He is ". . . not willing that any should perish. . ."²³; rather His purpose is that ". . . He might gather together in one all things in Christ. . ."²⁴

So rational beings outside the Earth, if there be any, are to be redeemed (some of them, anyway), and redeemed through Christ's sacrifice here on Earth, at Calvary. But that would seem strange. It seems to be considered fitting that the redemption be by One Who, in the human sense, was descended from Adam. ". . . since by man came death, by man came also the resurrection from the dead. For as in Adam all die, even so in Christ shall all be made alive."²⁵ Also, it seems to be important that the Son, in His incarnation, was ". . . made of a woman, made under the law. . ."²⁶

In the light of all this, the most likely conclusion from Scripture seems to be that there

are no rational (corporeal) beings outside the Earth. In that case, we might venture to suggest that there are not many irrational beings. For it seems to have been Gods purpose to put rational beings in charge of His Creation, to "... have dominion ... over every living thing that moveth. . ."²⁷. This argument might, perhaps, not exclude a few bacteria or lichens. It may be that, on questions of this sort, we can reach only probable conclusions.

It may be proposed that there must be rational corporeal living beings somewhere outside the Earth, for they have visited us, e.g. in flying saucers better called "unidentified flying objects" or simply UFO's. However, the evidence for UFO's is certainly not conclusive.²⁸

Even if it be granted that UFO's are real, it does not necessarily follow that they have come from outside our Earth. It is difficult to imagine a technically advanced race living on any of the other planets of the solar system. As for other planets, if there be any suitable ones, belonging to other stars, the problem of getting here from such distances would surely be very great. So the reality or otherwise of the UFO's has no necessary bearing on the question under consideration.

In final conclusion, then, it may be said that such evidence as may be obtained, 1. from general considerations, 2. from scientific observations, and 3. from Scriptural considerations are against the existence of rational corporeal living beings outside the Earth.

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- ¹⁴Psalms 115:16.
- ¹⁵Romans 8:22.
- ¹⁶Romans 5:12.
- ¹⁷Romans 3:10.
- ¹⁸Acts 4:12.
- ¹⁹Colossians 1:19 and 20.
- ²⁰Hebrews 9:22.
- ²¹Hebrews 9:28.
- ²²Romans 6:9 and 10.
- ²³II Peter 3:9.
- ²⁴Ephesians 1:10.
- ²⁵I Corinthians 15:21 and 22.
- ²⁶Galatians 4:4.
- ²⁷Genesis 1:28.
- ²⁸Markowitz, William. 1967. The physics and metaphysics of unidentified flying objects, *Science*, 157 (3794):1274-1279. Markowitz presents an excellent case against these UFO's being under extra-terrestrial control. He concludes, "The control of reported UFO's by extraterrestrial beings is contrary to the laws of physics. The data published do not justify the holding of investigations." (p. 1278)

THE NATURE OF SPECULATIONS CONCERNING THE ORIGIN OF LIFE

DUANE T. GISH*

Though a majority of scientists believe that the origin of life was due to a natural evolutionary process, a significant minority disagrees.

By examining some important implications and limitations, prejudicial aspects of the materialistic position are made manifest with regard to some of the experimental work being conducted today in support of speculations on the origin of life.

Attention is given to the impossibility of the existence of many present day reagents on a primitive earth, and to weaknesses of many comparisons of precellular models of actual cellular conditions, before a five point enumeration is offered of problems that must be solved by a naturalistic approach.

It is inherent in any acceptable definition of science that statements that cannot be checked by observations are not really about anything—or at the very least they are not science. (Simpson¹)

... how life originated, I am afraid that,

since Pasteur, this question is not within the scientific domain, at least if we consider probability as an essential part of a scientific statement. (Mora²)

Due to the nature of the process, the origin of life by an evolutionary process could have left no record for man to investigate. Any organic compounds which would have been formed abiogenetically, and which remained available to organisms, would long ago have been degraded.

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As a matter of fact, the presence in sedimentary rocks of organic compounds related to those found in present day organisms is taken as proof that life existed when the rocks were formed.³ Most geologists assume that most of the organic carbon present in the sediments has been derived from photosynthetic organisms.^{4,5}

No Direct Evidence Possible Ever

Therefore, I must repeat that no one should ever hope to obtain direct evidence related to the origin of life. No amount of sophisticated research can ever succeed in lifting this area of thought above a highly speculative plane. One will forever be postulating what *may* have happened or what *could* have happened, but one will never be able to answer the question, what *did* happen?

If the criteria of Simpson and Mora are accepted, and these are the criteria usually applied to scientific work, then speculations and experiments related to the origin of life lie outside the scientific domain. Bernal⁶ while discussing a paper by Mora said, ". . . Dr. Mora has shown that the principles of experimental science do not apply to discussions on the origin of life and indeed cannot apply in any problem of origin."

Nevertheless, since antiquity, man has been speculating concerning the origin of life (for a review of early speculations see Oparin⁷, Keosian,⁸ and Dauvillier⁹), and during the past two decades, an increasing number of scientists have begun to devote serious study to this question. The volume of scientific literature dealing with this subject has increased greatly during the past few years, and several international symposia have been held.

Most investigators in this area have adopted the conviction that no supernatural agent was involved in the origin of life, but that its origin was inherent in the property of matter under the conditions which have existed on the earth since its creation. Rejection of any supernatural intervention in the origin of life is often given as the basis for accepting a materialistic hypothesis. Thus Schafer has stated,

. . . setting aside as devoid of scientific foundation the idea of immediate supernatural intervention in the first production of life, we are not only justified in believing, but *compelled* to believe, that living matter must have owed its origin to causes similar in character to those which have been instrumental in producing all other forms of matter in the universe, in other words, to a process of gradual evolution.¹⁰

For the materialist, the fact that life exists is proof enough that it did evolve. Doubtless, a

majority of scientists believe that the origin of life was due to a natural evolutionary process. There is a *significant minority*, however, who disagrees.

Nature of Materialistic Position

The materialistic hypothesis, as outlined by Keosian, applies natural laws to the explanation of the origin of life. Beginning with an imagined abiogenic synthesis of organic compounds, proponents of this theory propose that the origin of life was the result of a series of probable steps of increasing complexity, inevitably leading up to the living state. The origin of life is not viewed as a remote accident, but "the result of matter evolving to higher and higher levels through the inexorable working out at each level of its inherent potentialities to arrive at the next level."¹¹

There seems to be some disagreement among evolutionists as to just how inexorable was the passage of matter through higher and higher levels until life arose. While many agree with Keosian that, given the properties of matter, the conditions postulated for the primitive earth, and the time postulated as being available, the origin of life was inevitable, others disagree. Urey has said,

. . . the evolution from inanimate systems of biochemical compounds, e.g., the proteins, carbohydrates, enzymes and many others, of the intricate systems of reactions characteristic of living organisms, and of the truly remarkable ability of molecules to reproduce themselves, seems to those most expert in the field to be almost impossible. Thus a time from the beginning to photosynthesis of two billion years may help many to accept the hypothesis of the spontaneous generation of life.¹²

Simpson, in his paper on the nonprevalence of humanoids in the universe, and from which came the opening quotation of this paper, has said, "Only the astronomical assurance that there may be many millions of earth-like planets permits us to assume that the origin of true, that is of cellular, life may have happened more than once." If the origin of life on the earth was inevitable in the amount of time available, then some men argue that, of course, life must have inevitably arisen on every other earth-like planet. Simpson denies this position.

Several Important Implications

The hypothesis of the origin of life held by most contemporary evolutionists, and as outlined by Keosian, contains several important implications. The old idea that the origin of entire, complete living organisms was due to a sudden, chance arrangement of matter has been aban-

done. It is now recognized by most investigators that the probability of such an occurrence is zero.

Instead of life originating by a one-step, pure chance process, the origin of life is envisioned as the result of a long series of events spanning many hundreds of millions of years. The probability of each of these steps, it is postulated, though low, had some finite value.

Another important implication of this theory is that the origin of life was due solely to the property of matter. Now the property of matter is something we can investigate, and matter must have the properties the theory implies if the theory is correct.

For example, if matter has inexorably evolved upward through higher and higher levels, then one of the basic properties of matter must be the tendency to organize itself into higher and higher levels. If this is a property of matter, then we should be able to design experiments to demonstrate it. If the origin of life involved a self-replicating molecule, this ability to self-replicate was due solely to the property of matter and its arrangement in the molecule, and such a molecule *should be* just as possible today as two billion years ago. We *should be* able to find such a molecule in nature or should be able to construct one.

It is proposed that the complex polymers found in the living cell, such as proteins and nucleic acids, arose spontaneously from the sub-units of which they are composed under conditions postulated to have existed upon the primitive earth. Supposedly, this polymerization would have been due solely to the property of the matter composing the sub-units and the polymer under the postulated conditions. Such properties can be investigated, and attempts are being made in this direction.

Limitations of Preconceived Ideas

One important consideration must be mentioned. That is the tendency of all of us to allow our judgement to be influenced by our prejudices and preconceived ideas. This is notably true in the area of evolution, as has been emphasized by various investigators. In discussing how often preconceived ideas have affected the investigation of human origins, Hawkins¹³ points out how our greatest authorities were so badly fooled by the fraud known as "Piltdown Man."

Similarly, in his discussion of the mutation-selection theory, Martin¹⁴ had this to say: "What is really disturbing to me, if I may presume to say so, is the almost total lack of scientific caution and self-criticism current in genetical circles, in regard to the accepted theory of evolution by mutation." After mentioning several textbooks, Martin continues,

. . . the authors are all frank partisans of the accepted theory and almost completely devoid of a critical attitude. Their books are written entirely within the presuppositions laid down by the theory; they take it for granted and proceed to interpret a vast array of observations in its terms. Naturally their observations appear to confirm, or at least conform to, the theory. Such practices certainly will never bring any fallacies to light which the theory may contain, but will only serve to deepen the faith of the believer.

W. R. Thompson¹⁵ has said, ". . . in science heresy is a virtue and a reaction often a necessity, and in no field of science are heresy and reaction more desirable than in evolutionary theory." The above observations can be applied today with especial emphasis with regard to experimental work being conducted in support of speculations on the origin of life.

Attention to Reagents, Energy Sources

Much work purportedly related to the origin of life has been conducted under conditions or with the use of reagents which could not have existed on any possible primitive earth. An example that may be cited in the production of adenine nucleotides by irradiation of solutions containing adenosine and ethyl metaphosphate.¹⁶ Ethyl metaphosphate is prepared by the reaction of phosphorus pentoxide with ethyl ether in chloroform and is rapidly hydrolyzed by water. This synthesis has no relevance whatsoever to the origin of life, yet this work was cited as evidence that nucleotides could have been produced in the primitive ocean.¹⁷

The degradative effects of the energy sources employed for syntheses allegedly related to the origin of life has been almost completely ignored by most investigators. As a matter of fact, one of the common features of most of these syntheses is the use of a device, such as a cold trap, to rapidly remove the products from the reaction site.

The inclination of an organic chemist to remove his product from reaction conditions which would lead to subsequent decomposition is understandable. Unfortunately, there were no organic chemists on the primitive earth to facilitate this removal, and products formed abiotically would have been decomposed by the very energy sources that brought about their synthesis. Synthesis of amino acids by irradiation of a mixture of gases is interesting, but comparison of the rate of synthesis to the rate of decomposition would be critical in determining

whether this type of synthesis could have had any relevance to the abiogenic synthesis of amino acids.*

Weaknesses of Comparisons Noted

In some precellular models, properties of the polymer produced are compared to those of the naturally-occurring polymer in such a way as to render the comparison favorable, when in fact differences exist which are fatal to the model. For example, the properties of thermally produced polymers of amino acids reported by Fox and coworkers have been compared to those of naturally occurring proteins.^{18,19}

Similarities were pointed out to support the belief that thermal polymerization was the principal synthetic method that produced proteins and other macromolecules on the primitive earth. However, serine and threonine are present in these polymers, or "proteinoids," in only trace amounts. Serine and threonine are found in abundant amounts in almost all naturally occurring proteins.

Any synthetic method which might have some relevance to the origin of life must account for the incorporation of amino acids into protein in approximately the proportion found today. Certainly, the incorporation into a synthetic polymer in only **trace** amounts of constituents which occur in **abundant** amounts in the naturally occurring polymer should force abandonment of the synthetic method as a possible mode of synthesis in any origin of life scheme.

Impact of Naturalistic Viewpoint

The naturalistic point of view which today dominates our society, and scientific activity in particular, guarantees favorable reception to almost anything which supports evolutionary theory. In the face of the present day abundance of manuscripts submitted for publication in technical journals, editors of these journals usually strive to limit publication to that material which is of significance and which has some reasonable scientific basis.

Some of the material which is appearing in technical journals today, however, indicates that criteria usually applied have been somewhat modified when articles considered contain support of some phase of evolutionary theory. One example of this is the total number of pages in journals and technical books devoted to photographs of the microspheres of Fox's proteinoids.²⁰

*Editor's Note: The reader might take particular note of the fact that *carefully planned* laboratory synthesis of biological material will in no way afford support for the *chance, accidental* origin of life imaginatively speculated as the beginning of supposed naturalistic, evolutionary processes by which life came into existence.

Some of these photographs were published to illustrate division of individual microspheres which *simulate* division observed in septate cocci,²¹ structural features *similar* to bacteria, a "budding-like" process, and a "blastula-like" microsphere.²²

The great importance attached to certain physical features of these microspheres, formed by the precipitation of amino acid polymers, which **resemble** features of some bacteria, reminds one of several works published about a half century ago:

(a) Using drops of olive oil in a solution of potash, Butschli²³ produced structures which threw out pseudopodia like amoebae, moving toward solid particles and even engulfing them.

(b) Leduc²⁴ used small pieces of melted calcium chloride immersed in saturated solutions of potash or tripotassium phosphate. Osmotic globules were formed, from the semipermeable membranes of calcium carbonate or calcium phosphate that were produced, giving structures that looked very much like algae.

(c) Herrera²⁵ carried out extensive studies on artificial structures which he produced. By mixing solutions of thiocyanates with solutions of formalin, for instance, Herrera obtained colloidal solutions of nitrogen-containing substances. When these were fixed with formalin, precipitation occurred and complex structures resembling cells were formed. Some of these artificial cells even had what appeared to be double membranes, also noted by Fox with some of his microspheres.

The features of Fox's microspheres which bear a **superficial resemblance** to such processes in living organisms as cell division, double membranes, and budding have no closer relationship to the actual processes in living cells than did the structures of Butschli, Leduc, and Herrera!! Yet Fox has assigned great importance to such features, and many other scientists and non-scientists have been equally impressed.

A naturalistic approach to the origin of life, must include solutions to the following:

1. Construction of a plausible primitive earth model based upon the best available evidence.

2. Description of chemical reactions which may have occurred under the above conditions, and the nature of simple chemical compounds which may have accumulated to a significant extent as a result.

3. Description of the formation, under the above conditions, of complex biologically important compounds, such as nucleic acids and proteins, and their accumulation in significant amounts.

(Continued on Page 83)

IS THE UNIVERSE A THERMODYNAMIC SYSTEM?

EMMETT L. WILLIAMS, JR.*

To ask the question, Is the universe a thermodynamic system?, is meaningless scientifically. Scientific opinions regarding the extent of the universe vary widely. Examples of both conservative statements and unqualified speculation are found in current reports. There is no way to determine the extent of the universe or its thermodynamic character at the present time using the scientific method alone. However, a Christian may use the Scriptures and reach the conclusion that the universe is a thermodynamic system, since it is subject to the first and second laws of thermodynamics. It is speculated herein that the universe is also an isolated thermodynamic system.

I. General Types of Thermodynamic Systems

If the universe can be considered as a thermodynamic system, it must be classified as open, closed, or isolated.¹ These terms may be defined:

(a) Open system: Exchanges both energy and matter with surroundings.

(b) Closed system: Exchanges energy but no matter with surroundings.

(c) Isolated system: Exchanges neither energy nor matter with surroundings.

Can the universe be placed in one of the above categories? To do so scientifically requires knowledge regarding the extent of the universe, and it would be helpful to have some knowledge of the material or energy content of the universe.

In normal thermodynamic operations, calculations are made on energy and mass transfers between the system and its near-surroundings.² There is an obvious problem; with what would the universe exchange matter or energy? However, let us explore what is known about the universe before discussing the exchange problem.

II. Extent of the Universe

Tolman states that

... we do not know whether the actual universe is spatially closed or open, and can choose between universes which are finite and infinite in spatial extent only on the basis of dubious metaphysical predilections.³

Inglis⁴ claims, "If our universe is Euclidean it could be infinite in extent"

Many scientists conclude that the universe is infinite.⁵⁻⁷ Other scientists consider the universe to be a closed system.^{8,9} Eddington¹⁰ prefers a closed system universe with an infinite radius. According to Newtonian theory the universe ought to be a finite island in an infinite sea of space.⁶ Einstein realistically states that

... a most interesting question arises for astronomers and physicists, and that is whether the universe in which we live is infinite, or whether it is finite in the manner of the spheri-

cal universe. Our experience is far from being sufficient to enable us to answer this question.¹¹

To confirm the above opinion, Ford¹² claims that the question as to whether the universe is finite or infinite, closed or open remains unanswered. Weizsäcker¹³ admits that we cannot observe the limits of the universe.

When writing about space, it is well to mention that, according to the general theory of relativity, the geometric properties of space are not independent but are determined by matter that occupies the space.¹⁴ It should be remembered, however, that the theory of general relativity is probably the least tested theory of nature, yet, the theory is widely accepted.¹⁵

Obviously the extent of the universe is unknown, and DeSitter¹⁶ bluntly states that the universe as far as science is concerned is just a hypothesis. Mulfinger¹⁷ aptly sums up what is known at the present concerning the universe, "Scientists are thoroughly stymied by the nature of the *present* world . . . we don't even know what it is." It is an understatement, then, to claim that scientists can offer no definite answer as to the extent of the universe. So far man cannot fathom the depth of the universe.

Possibly this is why God created the universe, to reveal His power to man (Psalm 19:1, Isaiah 40:26). Nowhere may man turn and not be confronted with God's power and Deity (Romans 1: 19,20). When men look into the heavens, they should be awed by the power of the Creator and realize their insufficiency to understand what is seen.¹⁸ When God confronted Job in order to humble him, He asked, "Do you know the ordinances of heaven?" (Job 38:33).

III. What is Known About the Universe?

In 1934 Tolman¹⁹ commented that it was possible to see out into the universe only some 100 million light years by using the Mount Wilson 100 inch telescope. In 1952 Krogdahl²⁰ stated that the observable region of the universe extended with the power of available instruments to a billion light years in any direction. In 1964 Abell speculated that the most remote observed galaxies were between five and ten billion light

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years away.²¹ Using information obtained from Orbiting Astronomical Observatory, astronomers claim that the universe may be several times larger than previously believed.²²

It is obvious that we have some knowledge only of the part of the universe which we can observe.²³ Abell²⁴ states it must be assumed that the part of the universe which we actually see is representative of the entire cosmos. Of course this is a bold step of faith.

Also the universe is normally assumed to be homogeneous.^{6,25} Since there is very little matter in the universe compared to the space of the system, Motz and Duveen²⁶ claim that when developing any models for the universe it can be treated essentially as empty. Morris²⁷ probably makes the most conservative statement of all when he maintains that the physical universe is simply a space-time-matter continuum. Again it should be obvious to the reader that scientists know very little about the universe.

However, some scientists are willing to speculate on the material content of the universe regardless of the dearth of knowledge about which they are speculating! As an example, Ford states²⁸ that there are approximately 10^{23} stars, approximately 10^{82} protons and the same number of electrons, yet fewer neutrinos, and an infinite number of photons and gravitons²⁹ in the universe. In the same place he maintains that there are fewer unstable particles than protons. To balance this assertative statement, he contends that one of the unanswered questions in science is whether the amount of matter (and energy) in the universe is truly constant. (p. 722) In other words, does the first law of thermodynamics hold for the universe?

IV. Conservative Statements by Scientists vs. Unqualified Speculation

The preceding paragraph is an example of reasonable statements in scientific circles (admitting that it is not known scientifically if the first law is true for the universe) as opposed to reckless speculation (estimating the number of stars and particles in the universe). If a scientist is able to predict the number of particles, should he not also be able to predict with a degree of certainty whether the first law applies to the universe?

I have found that some scientists become very conservative when expressing the limits of the first and second laws of thermodynamics yet will go to radical degrees of speculation when defending any form of the evolutionary hypothesis. This is interesting since the first and second laws are "the best science" we have today, being experimentally verified, whereas accepting and promulgating evolution requires sheer faith in

an unproven absolutely unverifiable hypothesis.³⁰ It is my opinion that scientific statements concerning the first and second laws of thermodynamics and their application to the universe should be conservative since so little is known about the universe. Also, any statement about the evolutionary hypothesis should be very cautious.

It is interesting to examine some statements concerning the first and second laws and their relation to the universe since they apply to this treatise. In discussing thermodynamic systems, Kestin gives the following commentary:

The material objects not included in the system inside its boundary constitute its surroundings. We may be inclined to say at this point that the surroundings of a system therefore include "the rest of the universe." In order to avoid speculation about the nature of the universe on whether it is contracting, expanding, or oscillating it is not necessary to succumb to such an impulse.³¹

This is a reasonable statement based on present scientific knowledge. When discussing the first law, he states,

In connection with the enunciation for the principle of energy conservation . . . the reader must contain his impulse to consider the "whole universe" as an isolated system and to state the first law of thermodynamics in the sweeping form that the energy of the universe is constant. In order to give a precise meaning to such a statement it would be necessary to analyze in detail the nature of our universe, a task which transcends the resources of present-day science. Otherwise, the assertion becomes a mere, emotional, oratorical exclamation.³²

In discussing the second law, he notes

since the principle of entropy increase has been enunciated in terms of an isolated system the already familiar impulse to equate the universe with an isolated system presents itself in this context too and the statement is made that the entropy of the universe increases. This together with the parallel statement that the energy of the universe remains constant leads to the speculation about the gloomy consequence which would follow when the entropy of the universe will have reached a maximum so that it could increase no more. All processes would be arrested and the universe would die an entropy death. For reasons outlined . . . we do not believe that any physical meaning can be ascribed to statements of this kind.³³

These are examples of quite conservative scientific statements. We honestly do not know enough (scientifically) about the universe to

know if the first and second law apply, or even to judge if the universe is a thermodynamic system.

For a statement similar to those previously quoted from Ford, consider the following remark by Blinder, which is a cautious statement coupled with imaginative speculation:

The entropy-death hypothesis for the universe is almost certainly fallacious in view of the fact that the second law of thermodynamics is not an absolute principle. It is rather a statistical generalization based on the most probable behaviour of a large assemblage of molecules. Even in a thermodynamic system at equilibrium there spontaneously occur large and random fluctuations within microscopic sub-units of the system. Now the universe is so enormous in size and so prolonged in duration that events on the scale of births and deaths of stars—and perhaps even galaxies—might rank among statistically admissible fluctuations.³⁴

The **cautious part** of the statement is that we just cannot know scientifically if the universe will die an entropy death because our knowledge of the universe is too limited. The statement then gets progressively worse from a scientific standpoint. According to the statistical interpretation of thermodynamics, fluctuations can occur within thermodynamic systems.³⁵

However, as pointed out by Wilder Smith,³⁶ the next fluctuation would cause the system to return to an equilibrium situation. An ordering fluctuation following an ordering fluctuation, etc. would be an upward evolutionary process, and it would be an *observable* contradiction to the second law of thermodynamics. Such a case has never been substantiated to my knowledge and is only a fancy dream in many evolutionists' minds because it is necessary for their supposed process.

The last part of Blinder's statement is **pure speculation**. To say the universe is prolonged in duration is a statement of faith, not scientific knowledge. Scientific dating methods have been examined in previous Creation Research Society publications, particularly the September, 1968 *Quarterly* and articles in this *Annual* issue. The age of the earth or the universe **cannot** be determined utilizing the scientific method. The birth of stars has never been seen, much less verified.³⁷ Discussion of the birth of stars or galaxies is not part of scientific activity but an application of evolutionary faith, a necessary step in the supposed evolutionary sequence of the universe.

It is interesting to note that the most frequent statements made as to limitations of the first and second laws of thermodynamics are voiced

when these laws clash with evolutionary theory. Yet evolutionary guesswork may be expressed in one imaginative form after another and be acceptable in so-called scientific circles. Many scientists attempt to show a naturalistic beginning and development of the universe when they don't even know what the universe is! It would be well to heed Abell's remark,³⁸ "Cosmology is one of the most difficult and most speculative fields of science."

Other astronomers have made opposite claims to that provided from Blinder. Krogdahl³⁹ believes that the universe will approach a heat death. Weizsäcker⁴⁰ says that the second law of thermodynamics has been applied to astrophysics with good success. Mulfinger⁴¹ claims all observable processes in the universe are seen to be degenerative when properly interpreted.

V. Scientists and the Universe

Considering all of the previous statements it is simply impossible to tell if the universe is a thermodynamic system using the scientific method. We do not know enough to make a positive statement. Scientists must be mute on the subject. God may have intended it this way, and Surburg makes an interesting comment on this:

After setting forth in verse I [Genesis 1] the creation of the entire universe, "the heavens and the earth," the author leaves "the heavens" as lying outside the sphere of investigation.⁴²

VI. The Universe in Scripture

Since the scientific method cannot be used for the question under discussion, we now go to the final authority on the universe to seek any revelation from the Creator. Some references from Scripture were given in an earlier section. In addition, Isaiah 55:9 and Job 22:12 indicate that the heavens are vast, a fact admitted by modern-day scientists. Today's astronomers would have to answer, no, to the question presented in Job 38:33. Ecclesiastes 8:17 mentions that there are many things mankind will not learn, and this possibly could be applied to a knowledge of the universe. What about new scientific evidence that might be found as men investigate the universe? Raymond states,

Man does not live then in an impersonal or uninterpreted universe, for every fact of the universe is what it is because of the direct exertion of the divine will of the Creator.⁴³

No matter how much more man may learn about the universe, he will be unable to successfully "explain" its origin by natural means.

Is the universe a thermodynamic system? Consider these verses:

For the whole creation was made subject to vanity . . . (Romans 8:20).

For we know that the whole creation groaneth and travaileth in pain together until now (Romans 8:22).

These are essentially scriptural statements of the second law of thermodynamics. Thus it is obvious that the universe is subject to the second law. From II Peter 3:7 it can be seen that the universe is subject to the first law of thermodynamics. Since the universe is subject to these laws of thermodynamics, a Christian can reach the conclusion that the universe is indeed a thermodynamic system.

Is the universe an open, closed, or isolated system? Admittedly this question leads to pure conjecture. With what could the universe exchange matter or energy? God *could* intervene in His cursed creation. Would He add or take away energy from the universe (an energy exchange)? It is impossible to answer such a question.

However, setting aside for the moment any direct intervention by God, the universe can be considered as an isolated system, since it does not appear to exchange energy or matter with any surroundings. Frankly this is a guess, but it appears plausible.

One can observe that degeneration of parts of the universe is called for by Scripture. As stated in Scripture, the first law of thermodynamics is operating in the present heavens. Since the universe is subject to these laws of thermodynamics and no matter or energy exchange can be observed, it is *assumed* here that the universe is an isolated thermodynamic system,

Whether the universe is open, closed, or isolated, it is definitely degenerating. No matter what type of a thermodynamic system is chosen, the entropy of the system always increases with the occurrence of an irreversible process.

VII. Conclusion

It is not possible using the scientific method (observation) to determine if the universe is a thermodynamic system. Scientists should remain mute on the subject, as scientists. However, from Scriptural evidence it is concluded that the universe is a thermodynamic system. It is further speculated that the universe is an isolated system. From these inferences one may suggest that the evolution theory, which demands decreasing entropy, is still indefensible in the face of the second law of thermodynamics.

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LETTER TO THE EDITOR

In reply to the Letter to the Editor by Emmett L. Williams, *Creation Research Society Quarterly*, 6 (3): 155 (December, 1969), whether a general scientific conservation principle encompassing both energy conservation and biological conservation is possible, the following observations are pertinent.

The first law of thermodynamics as you stated in your March, 1969 article (A Simplified Explanation of Laws of Thermodynamics, *Creation Research Society Quarterly*, 5:138ff.), involves essentially the concept that matter and energy can be transformed, one to another, but the total energy content of the universe remains the same.

This means that, except experimentally, no new mass is now originating in the universe. And of course the second law, among other things, involves the concept that the conversion of energy into mass (or vice versa) is never 100% efficient, and so there is an ever increasing unavailability of energy, or tendency toward disorder.

Now regarding inheritance in plants and animals, we do of course have much evidence of degeneration. Also of course the DNA system, originally created in order to have the great variety, both of and in plants and animals, must be substantially the same now as at creation, however due to mutation, the *quality* of the DNA units or system has changed.

As far as we can tell the changes in the DNA units are toward *inferior* offspring. This conclusion is challenged by our evolution-minded colleagues, who insist that some mutations are beneficial, though they are hard put to give examples. In fact, they claim that since the original primitive DNA system came into being spontaneously, mutations have *added* new DNA units or codons, thus leading to the complexity we now see. Modification of existing beneficial conditions is assumed.

Hence the only "law" I can think of as expressing our viewpoint might be stated: "Except for degenerative changes and losses (as extinct species) the total number of species determining DNA units now existing is the same as the number originally created."

Though I am not good at neatly expressing laws, one might perhaps combine both these laws by the following:

The law of conservation of energy essentially states that the total energy content of the universe remains constant, both inorganically as regards atomic reactions and biologically as regards the inheritance of an original total number of species determining DNA units.

The second law states that the conversion of mass into energy, or energy into mass, is never 100% efficient and leads to an ever increasing unavailability of energy or a tendency toward disorder in the inorganic realm. Likewise biologically, the DNA system becomes increasingly degenerate or disorderly due to the accumulation of random mutational changes.

No doubt the above can be simplified but at least it may prove helpful in promoting further discussion.

Signed,
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Research Editor
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Added Note

Dr. Emmett L. Williams sends the following letter excerpt as a follow-up to his December, 1969 letter that he received from David A. Shetland who stated,

I am convinced that such a conservation principle [any universal conservation principle] would find its firmest base in parallels drawn at the microcosmic level.

ORIGIN AND DEVELOPMENT OF THE UNIVERSE

THOMAS G. BARNES*

The generalized concept of energy and the law of conservation of energy are developed from a historical point of view. The second law of thermodynamics is presented as a companion law. These two laws are shown to present a paradox to evolutionary theories of the origin and development of the universe. The creation point of view is shown to remove that paradox.

Development of the Law of Conservation of Energy

The most important construct in the whole of physical science and probably of all science is the generalized concept of *energy*.¹ It took a long time for scientists to develop this concept. During the development, energy was first associated with mechanical work. Even today the basic unit of energy, the *joule*, is defined as the work done by a force of one newton acting through a distance of one meter.

It was Sir Isaac Newton who first introduced the principle of *conservation of energy*. He applied the principle to a mechanical system in which there was hypothetically no friction.

In such a mechanical system he concluded that *potential energy* (energy acquired because of the object's position, such as the energy acquired by a pendulum at the top of its swing) can change into *kinetic energy* (energy due to its motion), and vice versa, but that the total mechanical energy (potential plus kinetic) remains constant. Hence mechanical energy is conserved. Newton recognized, of course, that no such idealized system can be achieved, but if the friction is greatly reduced the system can be approximated.

Although the concept of a *conservative mechanical system* turned out to be a very fruitful one, it obviously needed to be supplemented. What became of the work done against friction and such non-conservative forces remained obscure for another century.

In 1795 Count Rumford performed his famous experiments on the heat produced while boring metal in the process of making gun barrels. He suggested that by the expenditure of enough mechanical work one could produce an arbitrarily great quantity of heat. Contrary to the belief of his day, the belief that heat was some *caloric* substance that flowed out like a fluid, he suggested that heat is just another form of energy. He introduced the principle that mechanical energy changed into heat energy. The principle of conservation of energy was emerging into the practical domain, taking account of the effect of friction.

Although we accept Rumford's mechanical theory of heat today without question, in his day the calorists questioned it and had answers that seemed plausible. Because of the tenacity with which reputable physicists clung to the caloric theory, it continued in general use for another half century. In fact it has been stated that no experiment has ever really demonstrated that the caloric theory is false, in the sense that it could not be accommodated to some result by the aid of enough *ad hoc* assumptions.²

Joule Established Energy Conservation

James Prescott Joule deserves the most credit for establishment of the principle of conservation of energy on the broad basis on which it has been accepted.³ In his famous paddle wheel experiment he measured the rise in temperature of the water due to the friction from the moving paddles. From that temperature rise and other data, he computed the *mechanical equivalent of heat*. Hence one is now able to express heat energy in terms of the unit of mechanical energy, namely the joule.

Albert Einstein showed theoretically that mass itself is a form of energy, and that its energy equivalent can be computed from the expression mc^2 , where m is the mass and c is the speed of light. Hence mass energy can also be expressed in terms of the unit of mechanical energy, namely the joule (when mass is in kilograms and c is in meters per second).

Research of Enrico Fermi and others has amply demonstrated that mass can be transformed into heat and other forms of radiant energy through nuclear fission or through nuclear fusion. In fact it now seems clear that the sun's radiant energy is produced by nuclear fusion. In this nuclear fusion process, some of the mass of the nuclei of hydrogen goes into radiant energy and some of it ends up in the form of helium nuclei. But, in all these transformations, the sum total energy (mass energy plus radiant energy) remains constant.

We now know that this principle which is conventionally designated as the *law of conservation of energy* includes all forms of energy, whether it be mechanical energy, heat energy, chemical energy, electrical energy, or mass energy. This law states that *energy may change from one form to another form but the total amount of energy remains constant*. Hence ac-

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cording to this law, *energy cannot be created nor destroyed*. All of the experiments and observations in science show that there is **not one known exception** to this law. It is the most generally accepted principle of all science. Scientists can depend upon the law of conservation of energy.

A Companion Law

The *second law of thermodynamics* is a companion law to the law of conservation of energy, which is sometimes denoted as the *first law of thermodynamics*. Although according to the law of conservation of energy we are assured that the total amount of energy will not decrease, according to the second law of thermodynamics we are assured that the net availability of energy is decreasing. Hence the optimism of the first law is curbed considerably by the stark pessimism of the second law. Due to the second law, many scientists foresee a day of exhausted availability of energy—the so-called *heat death of the universe*.

Because of the important consequences of the second law of thermodynamics we need to consider it further. Initially, we note that energy can be classified as *available energy* and *diffuse energy*, which is not available for doing work.

Awareness of this diffuseness or degradation of energy developed out of attempts to design more efficient heat engines. The mechanical equivalent of heat was known, and it was shown that only a portion of the heat energy is utilized in the heat engines. Then it was shown by Sadi Carnot and Lord Kelvin that it is theoretically impossible to utilize all the heat energy in these engines, even if there were no friction in the engine.

Heat exhausted from the engine is diffuse heat (if exhausted at atmospheric temperature) and it is totally useless even though this energy is still conserved. Hence conservation of energy does not assure continued availability of energy. For example, the total energy of the sun (including that previously given off plus that yet to be emitted) will be conserved, but it will eventually become diffuse and unavailable for use.

Current theories estimate that the sun will cease to generate radiant energy within five billion years. By that time the earth would be without enough available energy to sustain life⁴ even though the solar energy would still exist in a diffuse form in the universe.

Paradoxical State of the Universe

The origin and development of the universe is a paradox in science. There is **no way** that the first and second laws of thermodynamics can be used to achieve a scientifically consistent explanation of the origin of the universe and its

transition to the present state. This is a paradox in science *per se*.

The first law of thermodynamics *forbids creation* of mass and all other forms of energy, but mass and other forms of energy do exist. Hence from the first law one would have to conclude that these constituents of universe have been in existence forever. If that were the case, one would then have to conclude from the second law of thermodynamics that the universe has already run down. Forever is long enough for all of the original energy to have reached the diffused state—the heat death of the universe. Obviously that is not the present state of the universe. Hence the paradox.

Since there are no creative nor self-winding processes known to scientists, one cannot escape this paradox unless he resorts to emendations that tend to overload his theory with *ad hoc* assumptions, as did the adherents to the caloric theory of heat. If one admits the indeterminacy of science in the domain of origins, and postulates the creation and winding up of the universe by God through means that lie totally outside the realm of these laws of science, he has no such paradox.

Evolutionists Seek to Escape Paradox

There are, however, those scientists of an evolutionary persuasion, who seek to achieve a scientific theory for the origin and transition of the universe to its present state. One of their most favored theories of the origin of the universe is the so-called “big-bang” theory.

According to this theory the universe began with all of the energy concentrated into a single primeval atom, which abruptly disintegrated flinging energy and resultant atomic constituents out into space and causing the whole universe to be in an expanding state. This expanding universe concept gives a plausible explanation for the *red shift* observed in the spectral lines of some of the stars.

The red shift could, of course, be produced by the Doppler effect of a source moving away from the observer. This theory was developed to lie within the framework of Einstein’s general theory of relativity and embodies his concept of curved space.

The point which should be emphasized here is that the big-bang theory *does not resolve the question of origins*. Even if that theory were correct, it leaves unresolved the question of origin of the energy in the primeval atom. The first law of thermodynamics lays down the constraint that energy can not be created, leaving as the only alternatives—eternal existence of all the energy or divine creation. According to the second law of thermodynamics, the energy would have run down into a diffused state of useless

energy if it had already been in prior eternal existence. It would not have been in the assumed original state of the primeval atom.

It is interesting to note what A. C. B. Lovell has to say about the dilemma associated with the primeval atom theory of the origin of the universe:

It would, of course, be wrong of me to suggest that this view of the origin of the universe demands necessarily the possibility of creation of matter by a divine act. On the contrary, those who reject God adopt a strictly materialistic attitude to the problem of the creation of the primeval atom. They would argue that the creation of the primeval material had no explanation within the framework of contemporary scientific knowledge, but would escape from the dilemma by reserving the possibility that science would, if given the opportunity of studying these initial conditions, find a satisfactory solution. Or they would evade the problem of a beginning altogether by following a further line of thought due to Gamow, that the primeval atom was not the beginning but merely a state of maximum contraction of a universe which had previously existed for an eternity of time.⁵

One cannot help but note that there is more rhetoric than true scientific thought in this attempt to escape the dilemma thrust upon anyone who attempts to use the laws of science to explain the origin of the universe.

Some have attempted to evade the constraints imposed by the first and second laws of thermodynamics by assuming that the universe is an open system. The essence of that argument is that energy may be supplied to our universe from some outside source. The questions remain as to how that "extra-universal" source could have originated, or why it has not run down if it had been in existence forever. Thus the logic leads back to the same basic interminancy.

Hence the solution to the origin of the universe is clearly beyond the scope of science. However, if one accepts the creation point of view, the problem of origin and development (or degeneration) of the universe to its present state is not paradoxical.

According to the creation point of view, the universe began by divine act as a fully wound up system, and the time of creation is not so remote but that the present state of the universe still has great potential.

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CARBON-14 AND THE "AGE" OF THE ATMOSPHERE

MELVIN A. COOK*

Formation of Carbon-14 (C^{14}) in the earth's atmosphere exceeds the known rate of decay for C^{14} by a significant amount. The author of the radiocarbon method, Dr. Willard Libby, has attempted to explain this discrepancy by assuming that some of the C^{14} is continually and irretrievably deposited in sediments.

The present paper shows that Libby's explanation leads to preposterous conclusions and is no "explanation" at all. The discrepancy continues to exist, it is real, and it is evidence that may be used to defend the Biblical, not the geologic time scale.

Comments on Creation

The popular position of some scientists on the origin of the earth places its beginning about 4.5 billion years ago. But *historically* Adam and Eve left the Garden of Eden, as the first of mortality—man or beast—only about six thousand years ago. "Earth," i.e., the dry land which the

Lord called "earth," appeared at the beginning of the third day of creation.

Though most geologists generally assume a rigidly authoritative stance concerning the antiquity of the earth, as a matter of fact, no sound scientific evidence exists to support a 4.5 billion year old earth. Instead, the best evidence still supports an age only about a millionth as great, an age that is in accord with Bible history. After extensive studies of the available information on this matter, it is my opinion that *actually nothing* exists in the way of sound scientific evidence even to permit scientists to go back in history

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from the Noachian Flood, a real and tremendous catastrophe which effectively erased all earlier prehistory. The only history available for the antediluvian period is that found in the Bible itself, and this history denies uniformitarian geologic prehistory!

In reaching this conclusion, due account has been taken of the various radioactive dating methods.¹ Only the radiocarbon method appears to have real and sound usefulness in geologic dating and then only if due regard is taken of the *nonequilibrium* of Carbon-14 (C^{14}) in the earth as a whole. The evidence of nonequilibrium of radiocarbon in the carbon cycle leads to a radiocarbon age of less than 10^4 years (10,000 years) for the atmosphere itself! In fact, the "beginning" of radiocarbon in the atmosphere seems not to be the beginning of the earth, but rather in the flood, perhaps only about 4,500 years ago.

The whole atmosphere seems to have been fluxed such as to be cleansed of radiocarbon during the flood. Most of the carbon in the antediluvian carbon cycle (hydrosphere, atmosphere, lithosphere, and biosphere) was apparently *Locked out* of the cycle by sudden deposition along with all but the representatives of the species taken into the Ark as needed to regenerate the biosphere.

Attention to Recent Proposals

By way of a brief updating of my criticism of the *equilibrium model* of radiocarbon,² let us consider a statement by Dr. Willard Libby given in the *Sixth International Conference of Radiocarbon Dating*. (CONF 650652, "Proceedings of the Sixth International Conference on Radiocarbon and Tritium Dating," Washington State University, page 750, June 7-11, 1965. Atomic Energy Commission, Clearing House for Scientific Information, National Bureau of Standards, U.S. Dept. of Commerce, Springfield, Va. 22151.) Libby there reiterated the value of $2.5 C^{14}$ atoms per square centimeter, per second*, for the rate of formation of C^{14} in the atmosphere, as compared with the value 1.9 for the rate of decay of radiocarbon. Included in his comments was the following interesting new attempt to answer my nonequilibrium challenge:

(The difference between 2.5 and $1.9 C^{14}$ atoms/cm²sec) appears to be nicely explained by radiocarbon taken down irretrievably and irretrievably by deposition of calcium carbonate in the sediments. From a sedimentation rate of 2.5 cm per millennium with a calcium carbonate content of 35 percent and assuming shells to have the C-14 composition

of living matter, about 0.5 [why not 0.6?] radiocarbon atoms appear to be removed each second/cm² on the average. Thus we seem to have a state of equilibrium at the present time . . .

Such tugging and pulling on observed data is bound to get one into serious trouble at some time or other; Libby seems here to have trapped himself by his new explanation of the apparent radiocarbon unbalance.

The total carbon of the biosphere-atmosphere-hydrosphere is given by Libby as 8.3 grams/cm², but he regards this as an apparent value only, as far as the radiocarbon reservoir is concerned.³ This is because he has assumed that radiocarbon is in equilibrium. Now one actually observes 13.56 counts of radiocarbon decay each minute for each gram of ordinary carbon of the biosphere. From this value and the value 8.3 grams carbon/cm² one obtains $1.9 C^{14}$ atoms/cm²/sec. (Note: 13.56 counts per minute is 0.226 counts per second and $0.226 \times 8.3 = 1.9 C^{14}$ atoms/cm²/sec.) In order to identify an equilibrium, Libby must account for $2.5 C^{14}$ atoms/cm²/sec as the rate of decay because this is the rate of formation. In other words, in equilibrium the rate of decay must equal the rate of formation. But in order for this to be so, the total effective carbon in the atmosphere-hydrosphere-biosphere cycle would have to be $8.3 \times 2.5/1.9$ or 11 g/cm^2 . Thus, Libby must account for 2.7 g/cm^2 more total carbon in the biosphere-hydrosphere-atmosphere cycle than was originally estimated by him (i.e. 8.3 grams/cm²).

Calculation Difficulties Itemized

But even this figure of 8.3 grams/cm² is too high by the amount effectively locked out of this inventory by ocean circulation lag, namely, about 0.6 grams/cm² based on Libby's estimated 1000 year circulation lag. Therefore, Libby's new explanation for the discrepancy requires a loss by *irreversible and irretrievable* deposition of CaCO_3 of 3.4 grams/cm^2 every 8300 years (the mean life of C^{14}).

The value 3.4 grams/cm^2 is the part of the total carbon that must be lost by sedimentation every 8300 years in order to make the decay rate equal the formation rate (the requirement for equilibrium) in Libby's new explanation for the discrepancy between the observed rate of formation and the observed count of radiocarbon in biospheric carbon samples. This is simply $11 - x = 3.4$ where x is the effective total carbon/cm² in the biosphere-atmosphere-hydrosphere cycle. That is, Libby's new model of sedimentation of carbonates to remove the excess radiocarbon requires 3.4 grams/cm^2 of total carbon to be removed every average life of radiocarbon,

*The abbreviation atoms/cm²/sec will be used hereafter.

namely, 8300 years. This value of 3.4 is arrived at as follows:

(a) Of the 8.3 grams/cm² in the total hydrosphere, biosphere and atmosphere one must discount part of it by the fact that part of the hydrospheric carbon is effectively locked out of the cycle by an ocean circulation lag. (The average turnover time of the oceans is about 1000 years.)

(b) After taking the ocean circulation lag into account, we find that the effective total carbon in the biosphere-hydrosphere-atmosphere cycle is only about 7.6 grams/cm² instead of 8.3 grams/cm².

(c) Therefore, in order that the total *effective carbon* in the actual postulated whole cycle (which includes some carbon in the lithosphere as well, namely, that lost by sedimentation of carbonates) will amount to 11 grams/cm², one must assume that an effective 3.4 grams/cm² of the carbon in the sediments is actually involved in the radiocarbon cycle.

(d) To involve it, Libby is simply assuming that this amount of carbon is being lost by sedimentation at the rate needed to account for the difference $2.5 - 1.9 = 0.6$ C¹⁴ atoms/sec., namely, 3.4 g/cm² every average life (8300 years) of radiocarbon.

The actual loss requirement is probably nearer 5.0 g/cm² every 8300 years considering the fact that considerable *tugging and pulling* has been practiced already in arriving at the value 2.5 C¹⁴ atoms/cm²sec, the value 2.9 C¹⁴ atoms/cm²/sec being the one found in Lingenfelter's original work on this matter.⁴ Now to be strictly "*irreplaceably and irretrievably*" lost could mean that the 3.4 (to 5.0 or more) grams/cm² of the total carbon (carrying its required C¹⁴ contingent) is not replaced in the (atmosphere-hydrosphere-biosphere) carbon cycle by radiocarbon-free carbon. This implication is drastic to uniformitarians, but so also is any conceivable alternate interpretation of Libby's glib statement.

At the minimum required loss rate of 3.4 (to 5.0) grams/cm² every 8300 years, the present total inventory of 8.3 grams/cm² would be depleted in only 18 (to 14) thousand years, and the estimated 1800 grams of carbon/cm² now in the entire sedimentary column would have accumulated in only 530 (to 360) mean life periods of C¹⁴, i.e., 4.4 (to 3.0) million years. (Note: The value 1800 grams of carbon per square centimeter comes from G. P. Kuiper. 1954. *The Atmosphere of the Earth and the Planets*. University of Chicago Press, Chicago, Ill. See Chapter 6 by Mason.) What does this do to prehistory which requires that the sediments since the Precambrian have accumulated in about

600 million years? Libby's rate of accumulation is 135 to 200 times greater than a uniformitarian view of the sediments would allow!

An Alternative Interpretation

A generous alternate interpretation of Libby's "explanation" is that even the *locked out* carbon in the sediments is *not actually locked out*, but rather re-circulating (slowly) in an atmosphere-hydrosphere-biosphere-lithosphere distribution cycle with the lithosphere part of it, like the hydrosphere component, involving a "circulation lag": the former distribution cycle an approximately 4.4 million year lag, and the latter "circulation lag" about a thousand year lag.

Even this alternative interpretation of Libby's "irreplaceably and irretrievably" lost C¹⁴ carries serious implications for historical geology and uniformitarianism:

1. According to accepted estimates there are about 2.5×10^5 grams of sediments/cm² of the entire earth's surface. Assuming with Libby that they contain an average of 35% carbonates (or 4% C) there would be 10,000 grams carbon/cm², not the estimated 1,800.* Hence Libby apparently over-estimated the carbon content of sediments more than five-fold.

2. According to conventional prehistory, the 2.5×10^5 grams/cm² of sediments were supposed to have been deposited in about 600 million years at a (uniform) rate of deposition of $2.5 \times 10^5 / 6 \times 10^8 = 4 \times 10^{-4}$ grams/year of sediments,** and the carbon deposition component should thus amount to $1800 / 6 \times 10^8 = 3 \times 10^{-6}$ grams/year. Libby's "explanation" would require more than $3.4 / 8300 = 4.1 \times 10^{-4}$ grams/year, which, as already noted, is a deposition rate more than 130 times greater than that allowed by historical geologists. (Thus, both alternate interpretations of Libby's "explanation" over-estimate the deposition rate if conventional historical geology is considered valid. I, of course, do not consider that rate valid.)

3. The average *contamination* of all samples by radiocarbon-free carbon would, in this second alternative interpretation of Libby's explanation, currently amount to $(3.4 \times 100 / 8.3) = 40\%$! Thus, retrievable carbon (containing no C¹⁴) in this proportion to the total carbon inventory would make all specimens appear older than they really are even in the steady state model. There may be something to this as a *living* mollusk is sometimes found deficient in C¹⁴ to such an extent *as to appear* to have been dead as long as 3000 years!

*Note: $2.5 \times 10^5 = 250,000$ grams of sediments per square centimeter. 4% of 250,000 = 10,000 grams of carbon per square centimeter.

**Note: $2.5 \times 10^5 / 6.0 \times 10^8 = 250,000 \div 600,000,000 = 0.0004$ (or 4×10^{-4}) grams of sediment per year.

Conclusion

There is thus no solution at present in the uniformitarian viewpoint to the discrepancy between the rate of C^{14} formation (2.5 atoms/cm²/sec.) and the rate of its decay (1.9 atoms/cm²/sec.). This discrepancy vanishes if one assumes (as the Bible indicates) that the earth and its atmosphere have both been created quite recently.

According to a recent creation view, one would expect formation of C^{14} to exceed its decay, as the earth's atmosphere would as yet be in the "build-up" phase for C^{14} . Further de-

tails regarding C^{14} and recent creation are given in my book, *Prehistory and Earth Models* (Max Parrish and Co., Ltd., 1966).

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TIME, LIFE AND HISTORY IN THE LIGHT OF 15,000 RADIOCARBON DATES

ROBERT L. WHITELAW*

In the twenty years since introduction of radiocarbon dating by Libby, some 91 universities and laboratories in 25 different countries have dated over 15,000 independent specimens of once-living matter. Almost every imaginable form of life both recent and ancient is represented, gathered from every corner of the globe, including "prehistoric" man, a wide range of fossil flora and fauna, and even coal, petroleum and natural gas. All such matter is found datable within 50,000 years as published.

When the published dates are corrected for a basic scientific error in the method, they not only point to a recent creation, but they show an unmistakable world-wide disappearance of man and animals for a long period about 5,000 years ago. On the hypothesis that this drop-off corresponds to the Genesis Flood, it is then possible to derive a Carbon-14 production rate variation with time, which in turn leads to a better correction from published to true dates.

When the true dates of 9,671 independent specimens of animals, trees and human culture are then separated into three categories, and their distribution studied from creation to present in 500-year intervals, a most remarkable confirmation of the details of Biblical Creation and Noachian Flood can be seen on fourteen separate counts. This is shown graphically in Figure 3.

The hypothesis employed is thus confirmed! The evolutionary concept of time, life and history stands thoroughly discredited, and the Biblical record of creation and flood just as thoroughly vindicated.

Introduction

A hundred years after Darwin, the theory of total evolution appears to have swept the field of all challengers. The idea that multiform life, order and complexity all arrived on the scene by mere chance from lifeless, lawless chaos is now accepted almost without question. Such an idea pervades the public press; it colors the teaching of history, philosophy and science; and in the life and earth sciences it is the general premise upon which new evidence is analyzed and new research performed.

Without adducing a shred of supporting evidence, a leading scientist¹ can boldly state: "There is no need of explaining the origin of life in terms of the miraculous or the supernatural.

Life occurs whenever the conditions are right. It will not only emerge but persist and evolve." Such statements are generally hailed as twentieth century wisdom, while the Biblical record is relegated to folklore.

Perhaps the best expression of the modern rationale for *total* evolution comes from the pen of George Wald:

The important point is that since the origin of life belongs in the category of at-least-once phenomena, time is on its side. However improbable we regard this event, . . . given enough time it will almost certainly happen at least once . . . Time is in fact the hero of the plot. The time with which we have to deal is of the order of two billion years. What we regard as impossible on the basis of human experience is meaningless here. Given so much time, the "impossible" becomes possible, the

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possible probable, and the probable virtually certain. One has only to wait: time itself performs miracles.²

Such an argument contains both a logical fallacy and a philosophical absurdity. If it is true, any incredible event becomes possible *at any instant*. Cinderella's pumpkin easily becomes a chariot; and the resurrection of Jesus Christ should likewise be accepted without cavil!

The argument, however, is advanced for a different purpose. It is satisfying, persuasive, and allays all doubt. And like the speculative "science" of a bygone day, it demands no evidence. Time alone—unlimited, inconceivable, unimaginable—becomes at once a fortress and a weapon with which to demolish opposition. No matter how well attested the evidence against evolution, it must crumble every time before the sweeping premise, "given enough time . . ." For if two billion years proves not enough, who can stop one from making it ten billion? Or ten trillion, if need be!

Such is the real basis of modern evolutionary theory. No matter how disguised as mathematics or science, it is simply **blind faith** that given enough time a miracle will happen. And not one miracle only, but a billion miracles in succession, all in the right place and right order without a single intervening mistake. (For no less a miracle than this is required to account for even a single cell!) Intoxicated with such a faith as this, it is no wonder that evolutionists remain deaf to the best arguments from logic, from evidence and from Scripture. The hero is *time*; and so long as it is inexhaustible, evolution is secure.

Time, however, is also the hero of another plot! It is central to the meaning and validity of the Biblical record. Whereas evolutionists demand immeasurable, purposeless, endless time, the Bible just as unequivocally demands acceptance of a world whose time is measured, purposeful and destined to end; and all in exact accordance with the eternal purpose of a sovereign God, "who worketh all things after the counsel of His own will." The result is that either the Bible stands and evolution falls, or evolution stands and the Bible falls. They cannot stand together.

Nor is there room for part-Bible and part-evolution with regard to concepts of time. For, if the Bible is untrustworthy when it speaks of time in Genesis 1, 5 and 11, it is equally untrustworthy when it speaks of time in Gal. 4:4, Acts 17:31 and Heb. 1:1. The challenge of evolution thus compels every scientist and scholar to face up to Biblical chronology as part of its total claim to authority. Is Biblical chronology true or false?

For such a task, modern scientists bring forth a special new tool—radiocarbon dating. Fifteen thousand dates are already published, with thousands more coming in each year. With these it is now possible, as never before, to compare the time-claims of evolution with the chronology of Scripture, and discover where the truth lies.

The Radiocarbon Dating Method

The radiocarbon dating method was first proposed and worked out by Dr. Willard F. Libby for which he received a well-earned Nobel Prize. By painstaking measurements of living matter of every kind all over the world, Libby was able to show that all living cells have the same specific radioactivity by virtue of the presence of approximately 765 atoms of Carbon-14 in every billion atoms of Carbon-12.

So long as a cell lives, this ratio is maintained by the constant cycle occurring between living matter and the carbon dioxide in the air and sea, known as the "carbon exchange reservoir." He then showed by atmospheric measurements at various latitudes and altitudes that the rate at which Carbon-14 (C-14) is being replenished in this reservoir by cosmic rays from outer space is *reasonably* close to the rate at which it is decaying in living matter.

He then *assumed* that these two rates are essentially equal, and that they have been so for many years. Thereupon was "born" the radiocarbon dating method used by scientists ever since, a period now over 20 years.

The validity of the above two assumptions will be considered later. Granting them for the moment, let us see how simple and sure the method is. By measuring the radioactivity of a specimen of once-living matter found today, and comparing it to the activity it had when it died, the elapsed number of years is simple to calculate. After 5,570* years the clicks per minute on a Gieger counter would be half the value at death; after 11,140 years the count would be down to one quarter; after 22,280 years down to a sixteenth, and so on. The only requirement is a pure sample unmixed with any other living or dead matter through all the passing years, *plus* the assumption that the radioactivity the specimen possessed at death was the same as all living matter exhibits today, namely 16.0** disintegrations per minute per gram of total carbon (dpm/g.)

Among the first specimens measured by Libby and his coworkers were some tree rings and relics of "known" date from ancient Egypt. The

*More recent analysis gives 5,730 years as a better "half-life;" a mere 3% error,

**16.2 in sea-shells, but 15.3 in vegetation and living tissue, due to the different ratio of C-12/C-13 in each group.

agreement was quite satisfactory. In 1952 the method was published in book form,³ along with some 200 dates of both archeological and geological specimens gathered from over 30 widely-scattered sites. A second edition⁴ was published in 1955, and special addenda to most chapters were included in a 1965 printing of the second edition.

Once the new radiocarbon clock had been thus established, scientists at universities and research centers all over the world entered the new research field, setting up their own dating laboratories. By the end of 1968 almost 100 laboratories were thus engaged as listed in Table 1. C-14 was recognized widely as a valuable new tool to identify the age of

TABLE 1
RADIOCARBON DATING LABORATORIES
(*Radiocarbon*, 10, pp. 169-177, 1968)

A	Arizona	MO	Vernadski Inst. of Geochemistry
ANL	Argonne National Laboratory	MP	Magnolia Petroleum
ANU	Australian National Univ.	N	Riken (Tokyo)
B	Bern	NPL	National Physical Laboratory
BIRM	Birmingham	NS	Nova Scotia
BLN	Berlin	NSW	New South Wales
BM	British Museum	NY	Nancy
BONN	Bonn	NZ	New Zealand
C	Chicago	O	Humble
CT	Caltech	ORINS	Oak Ridge Associated Univ.
D	Dublin	OWU	Ohio Wesleyan Univ.
DAK	Dakar	OX	U.S. Dept. of Agriculture
FR	Freiberg	P	Pennsylvania
FSU	Florida State	PI	Pisa
G	Goteborg	PR	Prague
GAK	Gakushuin Univ.	Q	Cambridge
GD	Gdansk	R	Rome
GIF	Gif-sur-Yvette	RI	Radiochemistry, Inc.
GL	Geochronological Laboratory	S	Skatchewan
GRO	Groningen	SA	Saclay
GRN		SH	Shell
GSC	Ottawa	SI	Smithsonian Institution
GSY	Gif-sur-Yvette	SL	Sharp Laboratories
GU	Glasgow University	SM	Mobil Oil Corporation
GX	Geochron Lab'y. Inc.	SR	Salisbury, Rhodesia
H	Heidelberg	ST	Stockholm
HV	Hannover	SU	Finland
I	Isotopes-A Teledyne Co.	T	Trondheim
II	Isotopes, Inc.	TA	Tartu
IRPA	Institut Royal Du Patrimoine Artistique	TAM	Texas A & M Univ.
ISGS	Illinois State Geological Survey	TB	Tbilisi
IVIC	Caracas	TBNC	Kaman Nuclear
K	Copenhagen	T F	Tata Inst. of Fundamental Research
KI	Kiel	TK	University of Tokyo
KN	Koln	TX	Texas
L	Lamont	U	Uppsala
LE	Leningrad	UCLA	Univ. of California, L.A.
LJ	Univ. of Calif., San Diego	UW	Univ. of Washington
LP	La Plata	V	Victoria
LU	Lund	VRI	Vienna Radium Inst.
LV	Heverle Louvain	W	U.S. Geological Survey
LY	Univ. of Lyon	WIS	Wisconsin
M	Michigan	WSU	Washington St. Univ.
MA	Manitoba	X	Whitworth College
MC	Monaco	Y	Yale
ML	Miami	PIC	Packard

TABLE 2

DISTRIBUTION OF RADIOCARBON SPECIMENS BY CATEGORIES

ARCHEOLOGICAL SPECIMENS IN CLASS I AND II:

Occupational charcoal, middens, bones, wood and clay artifacts, furnishings, wooden tools and structures, grain, dung, canoes, nests, fossils, barrows, skin, hair, tissue, blood, tusks, shell-mounds, scrolls, burial items, and such.

GEOLOGICAL SPECIMENS OF CLASS III:

Wood, such as stumps, logs, twigs or bark, either fossilized, petrified or natural; charcoal from fires unrelated to human occupation.

SPECIMENS PUT IN CLASS IV:

Seals, whales, fish, coral, shellfish and all other forms of marine life; insects, pollen, calcareous deposits, marl, lacustrine, sandy loam, peat, lignite, coal, petroleum, natural gas, tufa, gyttja, moss, pingo, ferns, seeds (ungathered), caliche, sapropel, carbonate mud, ocean floor sediments, lava, fossil flora, and such.

ancient cultural deposits and artifacts, to date pollen, shell deposits, buried trees and vegetation, bones and relics of the past of all kinds.

At the same time it was understood by all concerned that the method could give measurable dates only to about 50,000 years B.P. (before present), since the radioactivity from anything older would be scarcely detectable. Most certainly it was out of the question to expect any datings of fossils, petrified matter, coal, oil, or bones of prehistoric men or animals. Using evolutionary premises, scientists had long since assigned such matter to ages well beyond 100,000, and even in the millions of years. In short, only late Pleistocene and Holocene matter was considered datable. A date from tertiary strata was absolutely unthinkable, and a large number of specimens were fully expected to give "infinite" dates, i.e. too old to be measurable.

What have been the results? In a word, astounding! Astounding to every investigator with evolutionary presuppositions. But even more astounding when compared with the Biblical record—as we shall see.

Ten Amazing Facts Itemized

Commencing with the first group of 206 dates published in Libby's first edition, the list has now grown, and as of the end of 1969, includes over 15,000 dates of independent specimens of every kind gathered from every part of the globe by the 91 laboratories listed in Table 1. The wide distribution of these specimens by category and by geography is given in Tables 2 and 3.

TABLE 3

DISTRIBUTION OF RADIOCARBON SPECIMENS BY GEOGRAPHY

WESTERN HEMISPHERE SPECIMENS

(assigned to Class II)

United States (almost every state included, with most dates from areas of Indian and Eskimo culture), Canada (All provinces, Yukon and N.W.T. represented), Greenland, Mexico, Cuba and most of West Indies, Central America, Easter and Galapagos Is., South America (all countries), Antarctica, Bermuda.

AFRO-EURASIA SPECIMENS (assigned to Class I)

Iceland, Europe (every country), Morocco, Algeria, Libya, Tunis, Egypt, Sudan, Equatorial Africa, Nigeria, Rhodesia, most regions of central and south Africa, Ethiopia, Turkey, Palestine, Mesopotamia and Arabia (especially sites of classical antiquity), Iran, Afghanistan, India, China, Indonesia and southeast Asia, almost every S.S.R. in Siberia and central Asia, Japan, Taiwan, Philippines, Korea, Madagascar and islands of Indian Ocean, S. Atlantic Islands, Australia.

SPECIMENS FROM OCEANIA (Few in number, divided between Class I and II)

New Zealand, Fiji, Tahiti, and other mid-Pacific islands.

All these dates were published, up to the year 1958, in *Science*, and thereafter in the annual journal, *Radiocarbon*, with extensive details of the subject matter and location of each specimen. In summary, the stockpile of radiocarbon dates is now so numerous and broad, as to age, location and subject matter, that no informed scientist, nor historian, nor educator, nor publisher—no matter how dedicated to evolutionary premises can be excused from examining them and considering their profound implications.

Upon sorting through these dates and after checking the descriptive material, one may detect at least ten amazing facts:

(1) Practically every specimen of once-living material is found to be datable within 50,000 years. Very few are listed up to 60,000, and only three-three out of 15,000—are stated as "infinite;" these being some megapod eggs from a Philippine Islands cave.

(Note: To fully appreciate the significance of this, it must be emphasized that if Lyellian geology and evolutionary "time" are valid, if living matter has been accumulating and dying upon earth over supposed eons of time, then such a world-wide random sampling of buried organic matter should yield 20,000 undatable specimens for each one datable! Granted that

TABLE 4

PUBLISHED DATES OF FOSSILS, EXTINCT FAUNA,
AND "PREHISTORIC MAN"

(Partial list, selected from 250 specimens identified as such through 1969)

Radiocarbon, vol. 11, 1969: Age. yrs.

GaK-1042: Bone of *Metacurvulus astylodon*, Kei-jima, Ryukyu Is. 18,800

Gif-774: Molar of *Elephas Primigenius*, Thonon-les-bains, Haute Savoie 14,000

Tb-21: Coaly loam, Uzhgorod 12,050

Y-1163: Skin of *Nothroterium Shastense*, Aden crater, New Mexico 9,840

UCLA-1325: Fossil wood from La Mirada, Cal., below extinct Pleistocene animals of same species as in La Brea tarpits (see UCLA-1292) 8,550

OWU-190: Spruce wood beneath partial mastodon skeleton, Akron, O. 15,315

UCLA-1319: Mammal bones from Omo R. valley, Ethiopia (compare findings in same locality reported in reference 6 as "Australopithecus," and "dated" by K-Ar date of underlying sediments as "two to four million years old."). 15,500

UCLA-1321: Mammalian bones from Bed V, Olduvai Gorge, Kenya (compare references 5 and 7 which reported similar findings in same locality as nearly two million years old, based on K-Ar dates of sediments, findings by L.S.B. Leakey in 1959) 10,100

It is important to note that Leakey's fossil "Zinjanthropus" was found in Bed I whose strata, *not the fossil skull itself*, was dated by K-Ar at 2.03 million years.

But *Science*, 162:559 (Nov. 1/68) contains the frank admission, "Bed V overlies . . . occasionally even the basaltic lava *underlying* Bed I."

UCLA-1321 here dates the bones themselves in a horizon largely identical to that of *Zinjanthropus*. Also, since radiocarbon dating was well-established in 1959, why date "the various types of tuff associated with the fossil" and then wait 10 years before dating the fossil itself with radiocarbon?

Obviously, the underlying lava bed itself should raise serious doubts in a uniformitarian approach; and in any case K-Ar dating of *any* strata has been shown to be totally inconclusive in reference 14.

Radiocarbon, vol. 10, 1968:

M-1739-1783: Mastodon ulna and tusk; tusk and skull. Michigan. 9,910; 9,250

NY-73: *Homo neanderthalensis* bones.. Jebel Irhoud Cave, Morocco >32,000

GSC-611-614: Mastodon bones. Thamesville and Chatham, Ontario 11,380; 8,910

S-246: Mammoth bone, in fossiliferous sand. Kyle, Sask. 12,000

UCLA-1292: Sabre-tooth tiger, r. and l. femur, La Brea tarpits, L.A. Part of extensive analysis of Pleistocene fossil community" 28,000

GIN-7: Fossil bones, 1 m. deep in yellow clay. Molodova, Ukraine 10,590

GIN-93: Mammoth scapula, in Cro-magnon burial site. Kosinski, Siberia. 11,000

TA-121: Mammoth bones. Bysovaya, Konu ASSR (Pleistocene) 18,320

* * *

* * *

Radiocarbon, vol. 9, 1967:

A-195-536: Mammoth vertebra, and rib. Naco, Ariz; Clovis, N.M. 8,980; 6,370

ANU-9: Fossil wood, beneath tuff and lava. Auckland, N.Z. 31,000

UCLA-1069: Sloth dung. Gypsum Cave, Idaho 10,455

* * *

* * *

Radiocarbon, vol. 8, 1966:

I-1149-1150: NATURAL GAS, in cretaceous and eocene formations. Ala. and Miss. 34,000; 30,000

GIF-198-278: Fossil coal; and wood. Spain 5,025; 3,930; 4,250

GX-445: Fossil bone. Wadi Halfa. 6,485

I-622: Mammoth bones and tusks. Dent, Colo.; Rawlins, Wyo. 11,200

MO-334: Coal. Naryn R. Kirgizia. 1,680

MO-3: Fossil tree (salix). Taimyr L. 11,700

UCLA-720-722-723: Fossil bones. Middle Zambezi. 2,520; 2,010; 960

WIS-67-85-113: Fossil sphagnum and sedge peat. Manitoba and NWT. 5,780; 5,600; 2,170

Gak-643: Penguin bone fossils. Antarctica 6,100

N-141-3: Formation containing abundant mammalian fossils, including *Megaceros*, *Leptobison*, *Loxodonta*, and extinct flora inc. *Tsuga*, *Larix*, *Picea*, *Picea maximoviczii*. Hanaizumi, Japan 29,300-37,000

TABLE 4 (Continued)

<i>Radiocarbon</i> , vol. 7, 1965:	
GX-105: Jawbone of <i>Nototherium</i> sp. Boolcunda Cr., Australia	14,000
M-1254, OWU-126: Mastodon bones, Gratiot, Mich., Novelty, Ohio.	10,700; 10,654
UCLA-630: "BROKEN HILL MAN" Rhodesia (incl. animal bones)	9,000
NZ-1: <i>Diprotodon</i> molar. New Zealand.	11,100
UCLA-705: Ilium of dwarf mammoth. Santa Rosa Is., Calif.	8,000
* * *	* * *
<i>Radiocarbon</i> , vol. 6, 1964:	
A-372: Mammoth fossil vertebra. Rawhide Butte, Wyo.	9,600
Lv-17: Fossil wood. Leopoldville, Congo.	7,840
Sa-170: Piston cores, 400 cm. below Mediterranean floor	30,000
Sa-100: Fossil bank; incl. bovines, hippo, catfish. Adrar Bous, Sahara	5,140
Sa-49: <i>Myiodon manure</i> , Felt Cave, Chile.	10,200
UCLA-285: Fossil human and animal bones. Tabon Cave, Phill. Is.	21,000
* * *	* * *
<i>Radiocarbon</i> , vol. 5, 1963:	
NZ-7: Fossil tree-trunk, rooted. Aramaho, N.Z.	2,400
NZ-206-381: <i>Diprotodon</i> jaw and molar. Orroroo, S. Australia	6,700; 11,100
NZ-282: Fossilized herbs, interbedded in sediment. Ngaruawahia, N.Z.	16,300
GrN-2022: Neanderthal mandible. Haua Fteah, Libya.	40,700
GrN-1495: Neanderthal skeleton, Shanidar I Cave, Iraq.	50,600
* * *	* * *
<i>Radiocarbon</i> , vol. 4, 1962; and vol. 3, 1961:	
Trondheim dates: Fossil shells in Norway. Ten specimens.	7,250 to 11,200
T-172: Woolly rhinoceros skin. Nochnoj ASSR	38,000
M-1068: Fossil bone in bed of 27 extinct species. Muaco, Venez.	14,300
L-601: Skin and flesh of baby elephant. Fairbanks, Alaska.	21,300
Pi-75: Calcareous petrified wood. Campi Flegrei, Italy	10,090
* * *	* * *
<i>Radiocarbon</i> , vol 2, 1960; and vol. 1, 1959:	
A-30-31-32-33: Bones of mammoth, horse, tapir, bison, with charcoal and human implements. Lehner Mammoth Site.	6,877 to 8,330
M-569: Human bone in fossil breach. Algoma, Mich.	3,170
LJ-55: Wood from tree root packed around with bones of many extinct pleistocene animals. LaBrea tar pits. Los Angeles	14,400
LJ-82: Fossilized (phosphatized) log, 1500' in ocean off Mexico	28,000
* * *	* * *
<i>Science</i> , 1957 to 1958:	
W-418: Wood, in <i>Megalodon</i> beds, with <i>Megalonyx</i> , bison, <i>Equus</i> , <i>Tapirus</i> , <i>Odocoileus</i> . Evansville, Ind.	9,400
Y-103: Fossil skull, "FLORISBAD MAN," 19' deep. Florsibad, S. Africa with fossil bones of many extinct species.	>35,000
L-228: Fossil wood interbedded in Miocene sandst. and cong. Wash.	>27,000
L-137: Peat and wood <i>under</i> muck of early Pleistocene fauna, incl. elephant, horse, bison. Seward Pen., Alaska	8,800 to 10,200
* * *	* * *
<i>Science</i> , 1957 to 1951:	
H-145: Mammoth bone. Heidelberg, Germ. (Comment; incredible)	3,370
L-182: HOTU MAN. Charcoal from hearth of skeleton, Iran.	9,500
O-235: Charcoal, 20' deep, with bones of elephant, camel, horse, antelope, glyptodon, etc. Lewisville, Tex.	>37,000
W-169: "KEILOR SKULL" (previously believed to be oldest remains of homo sapiens) Keilor Terr., Victoria	8,500
L-127: Extinct superbison skin and tissue. Fairbanks, Alaska	>28,000
* * *	* * *
<i>Dates in Reference 3</i> (1952):	
C-558: Bison bone in gray sand horizon with elephant and other fossils, followed by diatomaceous earth with <i>extinct</i> bison as the most abundant fossil. Lubbock, Tex.	9,883
C-631: Crude oil. 1100' deep in Tulare form. Kern Co., Calif.	>24,000
C-632: Crude oil, upper or middle Pica form. Ventura, Calif.	>27,780
C-822: Charcoal from hearth in Sioux Co., Neb. written up in "Early Man" (Reference 12) as "Pleistocene mammals of Nebraska"	2,049
C-823: Charcoal from 9' level, Burnet Cave, N.M., associated with fossil remains of 62 diff. extinct species, incl. <i>Antiquus taylori</i> , <i>Preptoceras sinclairi</i> , giant bear, large horse.	7,432

TABLE 5

RECONSTRUCTION OF BIBLICAL CHRONOLOGY: CREATION TO PRESENT

ERAS	TIME	REFERENCE
I: ANTEDILUVIAN (Creation to Flood)	2000 yrs. (approx.)	Gen. 5 (per original Heb. and LXX texts; deduced from Mas., Sam. Pent., Modern LXX et al.)
II: POSTDILUVIAN OLD TESTAMENT	3000 yrs.	
Flood to Abram	1070	Gen. 11 (as above)
Abram to Exodus	430	Ex. 12:41, Gal. 3:17
Exodus to Temple	580	Judges, 1 Kings 6:1 (LXX)
Temple to Captivity	363	Kings and Chronicles
Babylonian Captivity	70	Jer. 25 and Daniel 9
Emancipation to the Cross	487	Daniel 9, Ezra 1, Luke 3:l also Josephus, <i>Antiq.</i>
III: NEW TESTAMENT (Cross to Present)	1940 yrs.	Calendar
	<u>6940 yrs.</u> (approx.)	

NOTE: Apart from the Bible there is *no* reliable means of dating any historical event prior to Christ. Classical dates based on Ptolemy's "canon" plus solar eclipses, and Greek Olympiads are in error by about 80 years. Ancient dates based on Assyrian eponyms, Manetho and Berosus are connected to present via Ptolemy.

many investigators were looking for specific ancient cultures, such as Indian, Mayan, Babylonian, etc. Nevertheless, all were still dated within 50,000 years *to the maximum depth of any deposit!* The great preponderance of samples, moreover, related to vegetation, shells, pollen, peat bogs, buried trees, fossiliferous clay, ocean-bottom cores, buried bones and cultural charcoal beds — *most* of which should have been undatable. Yet, all had measurable radiocarbon activity!)

(2) Samples in strata identified by the investigator as Pleistocene, Pliocene and even Eocene (i.e. 50 million years old to an evolutionist!), and most archeologic findings identified as Paleolithic, are found with dates much younger than 40,000 years.

(3) Even coal, petroleum, natural gas, and lignite are dated within 50,000 years. Yet the accepted Carboniferous period that supposedly produced them was 100,000,000 years ago!

(4) Of the most ancient dates, most belong to buried vegetation of all kinds.

(5) Over 220 dated specimens are identified as "fossil," semi-petrified matter or fossiliferous bed material.

(6) Many dates are of extinct flora, and fauna, hitherto thought to be early and middle Pleistocene, such as mastodon, mylodon, sabretooth tiger, etc. Almost all are dated between 10,000 and 30,000 years.

(7) All "prehistoric" human remains and artifacts are datable within 30,000 years, including such famous cases as Neanderthal Man, Broken Hill Man, Florisbad Man, Heidelberg, Keilor, Hotu, Olduvai Gorge *Zinjanthropus*, and Omo Valley *Australopithecus*. (Note: the latter are the very findings of Leakey, et al, claimed to be "ancient hominids" of two to four million years ago!^{5,6,7}).

(8) Deep ocean deposits and cores from 40 feet below deep ocean beds, supposed to contain the detritus of the most primitive forms of life, are dated within 40,000 years ago.

(9) Ancient artifacts dated by archeology (i.e. in Egypt, Syria, Iran, etc.), in general, show radiocarbon dates up to 500 years younger (according to reference 5), confirming the now-recognized tendency of ancient historians to exaggerate.

(10) The most ancient dates of human culture are found in the near east, while the oldest "human" dates in the western hemisphere are noticeably younger. To bear out the dramatic findings of facts in items (3), (5), (6), and (7) above, Table 4 lists 75 typical dates out of over 220 found in these categories to date.

That these facts have already disturbed some specialists of evolutionary geology and paleontology is shown by a typical statement in *Science* (October, 1956): "as a result of radiocarbon dates, all the previous interpretations of

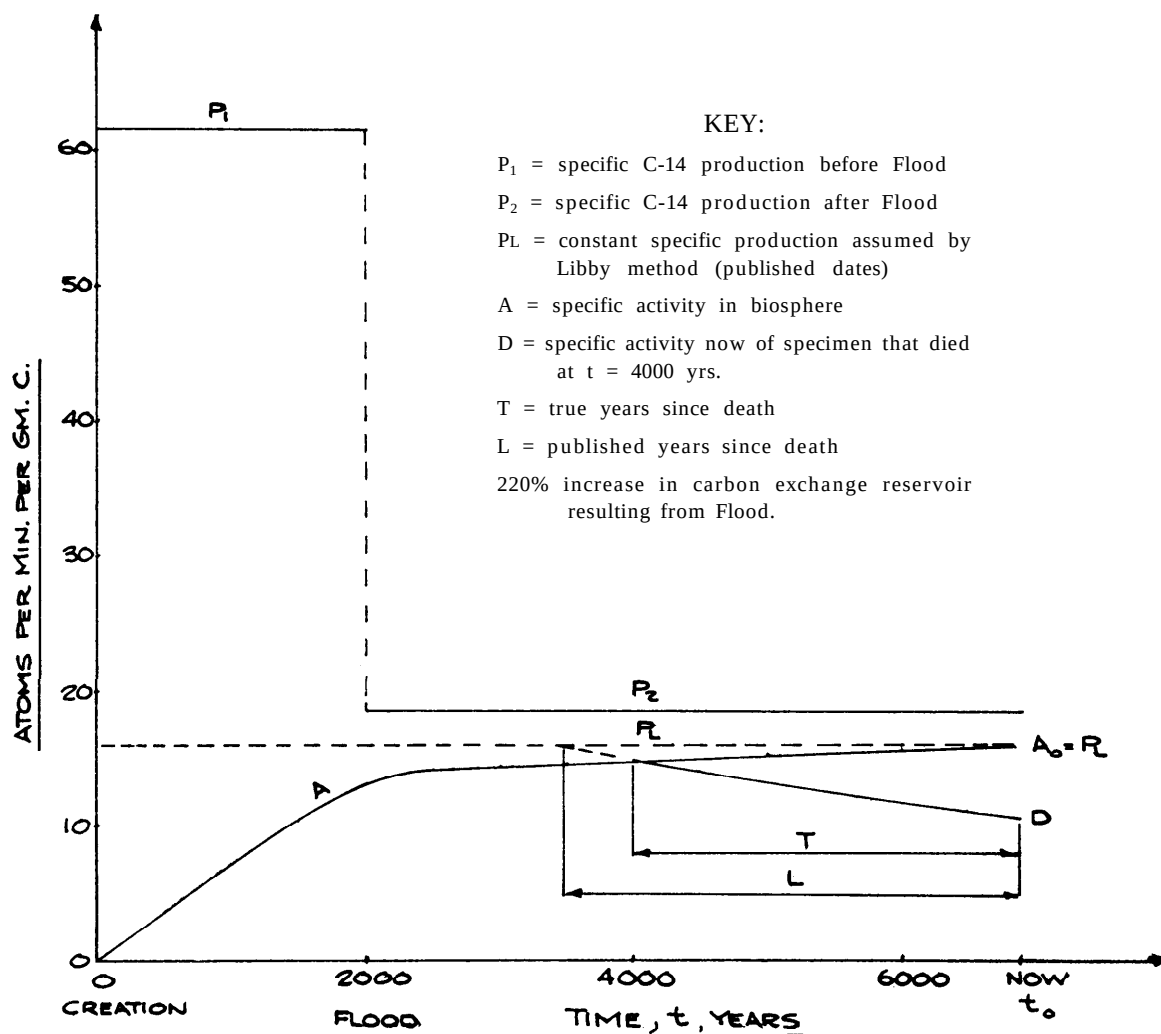


Figure 1.

Pleistocene lake history, depth and position in geologic time must be reassessed." (p. 669) Even more disturbing, however, are the facts that emerge from a more careful analysis of this great harvest of dates.

Here before us, gathered from all parts of the globe and covering almost every once-living form, we now have a sufficient number of death-dates to learn something from their distribution alone. If distributed by age, by location, and by type in accordance with some ancient historical record, it should not be difficult to confirm or refute such a record. Consider a chronology based on the Bible, for example. (See Table 5) It describes a creation a mere 7,000 years ago, followed some 2,060 years later by a world-wide catastrophe that all but extinguished man, animals and birds from the face of the earth. Now that we have a broad sampling of death-dates back to man's earliest beginnings,

surely such a strange record can be dismissed once and for all! Or is it just possible it might be confirmed?

Radiocarbon Assumptions Re-examined

First let us consider the date of Biblical creation. At the outset this seems clearly refuted by a host of C-14 dates much older than 7,000 B.P. We recall, however, that the radiocarbon dating system was built on two assumptions; namely, (1) the rate of production of C-14 in the atmosphere by cosmic rays is assumed equal to its rate of decay in living matter, at a value of 16.0 dpm/gm, and (2) this equilibrium is assumed to have been reached eons ago, so that all once-living matter datable by radiocarbon possessed this same activity when it died, namely 16.0 dpm/gm.

As to the first assumption, Libby himself conceded in his first edition (and on p. 7, second

edition) that whereas the specific activity (decay rate) of C-14 in living matter today is about 16.0 dpm/gm, the production rate is more like 19.0, an imbalance of almost 20%. This imbalance, to use Libby's own phrase, points to a recent "turning on" of cosmic radiation:

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. . . .* (Emphasis added) (p. 7, Second Edition)

Furthermore, a specific calculation of when this "turning on" occurred is easy to make. From the simple law of exponential buildup, $A/P = 1 - e^{-(6931/T)}$, in which we have the specific activity $A = 16.0$, the production rate $P = 19.0$, and the half-life of C-14 $T = 5,730$ yrs. The "turning on" date, T , comes out less than 16,000 years ago!

A second inescapable consequence of this imbalance is that the *true* age, T , of any specimen will always be *less than* the measured age, L , using Libby's assumptions (as published in *Radiocarbon*) since the latter is calculated as if no imbalance exists. The error ($L - T$) is illustrated in Figure 1 and clearly becomes progressively worse as age increases. Thus the underlying data on which the radiocarbon clock is built compel us to acknowledge (1) a recent

creation, and (2) a reduction in all published ages.

At this point an objector will rightly point out that the Biblical creation date is by no means yet confirmed; 16,000 is certainly less than 4,000,000,000; but it is still not near enough to 7,000 to make the Biblical chronology trustworthy.

The answer is not hard to find. There is good reason to believe that the production rate of C-14 has *not* been constant since creation, at Libby's value of 18.8 atoms/min-gm. Several observers^{8,9} would in fact place it higher even today—not realizing perhaps that this would make creation even more recent! But the best clue to the actual value of P in ancient times is derivable from the actual published dates.

Radiocarbon Dates Re-evaluated

First, we compute a *preliminary* set of corrections based on Libby's constant $P = 18.8$ back to creation, (see appendix A), giving a preliminary true age, T , for each published age, L . Then, out of all the published dates we take the 7,318 independent dates (defined later) pertaining to man and animals and apply the appropriate correction to each. Finally, we distribute these corrected dates into 500-year "boxes" from the present back to 8,500 years, and into 1,000-year boxes from 8,500 B.P. to "tentative" creation at 15,700 B.P. When this is done, the distribution of dates appears as follows:

TABLE 6

Corrected Date Span	Published Date Span	Number of Dates	Corrected Date Span	Published Date Mid-span	Number of Dates
(years B.P., "before present")			(1,000-yr. spans counted from 8,500 back)		
0- 500	0- 580	780	8,500- 9,500	12,150	72
500-1,000	580- 1,160	1,174	9,500-10,500	13,990	65
1,000-1,500	1,160- 1,745	857	10,500-11,500	16,050	52
1,500-2,000	1,745- 2,340	777	11,500-12,500	18,500	41
2,000-2,500	2,340- 2,940	628	12,500-13,500	21,570	39
2,500-3,000	2,940- 3,545	538	13,500-14,500	26,180	51
3,000-3,500	3,545- 4,160	447	14,500-15,500	33,460	127
3,500-4,000	4,160- 4,780	371	15,500-15,700	33,460 to	13
4,000-4,500	4,780- 5,410	290		infinity	
4,500-4,950*	5,410- 5,995	86			
4,950-5,500	5,995- 6,805	218			
5,500-6,000	6,805- 7,500	146			
6,000-6,500	7,500- 8,215	133			
6,500-7,000	8,215- 8,950	127			
7,000-7,500	8,950- 9,710	107			
7,500-8,000	9,710-10,500	86			
8,000-8,500	10,500-11,320	66			

Two anomalies clearly show up in this distribution. The first anomaly is the drop-off from 127 to 51 dates shortly after 15,700 B.P. The second anomaly is the drop-off from 218 to

86 dates immediately after 4,950 B.P. followed by a steady recovery. With so much data neither drop-off can be dismissed as mere statistical randomness. For the first anomaly we will find a

*The period 4,500 to 4,950 was arbitrarily contracted from 500 to 450 years in counting dates on grounds that, if it represents the first post-flood period, death dates in 4,950 to 5,000 are flood deaths; and if the flood is fictitious such a minor contraction should make no noticeable difference in column 3.

clue later, but reason for the second anomaly is unmistakable. We are warranted in assigning the second anomaly, until proven otherwise, to the one great event in history which certainly would have caused it; and the more so when we note that its date, 5,000 B.P., is substantially in accord with the historical record of the Genesis Flood.

For no matter how ignored and dismissed by evolutionists and uniformitarian geologists during the past century, the fact of such a world-wide cataclysm at just such a time has been amply attested by many competent writers.^{10, 11, 12, 13}

Method of Radiocarbon Date Correction

We see then that the radiocarbon record, using Libby's own data, gives evidence of a recent creation and of the Genesis Flood, even without knowledge of the exact variation of C-14 production with time, by which to pinpoint the date of each. In such a situation a well-established scientific method can be applied to ascertain the C-14 production rate in time past, thereby the true age of every radiocarbon specimen. The method is as follows:

(a) We state the *hypothesis* that, if the preliminary corrected dates in table 6 above reflect both Biblical Creation and Biblical Flood, then their *true* values would correspond precisely with creation about 7,000 B.P. and the flood close to 4,950 B.P.

(b) Assuming these two dates, we are then able to compute, by the procedure described in Appendix A, the most probable way in which C-14 production has varied.

(c) And given this C-14 production rate the relationship of true age, T, to published age, L, is shown to be as follows:

TABLE 7

True Age	Published Age	True Age	Published Age
1,000	1,155	4,000	4,725
1,500	1,730	4,500	5,350
2,000	2,310	5,000	5,990
2,500	2,900	5,500	8,860
3,000	3,500	6,000	12,530
3,500	4,110	6,500	19,100
		7,000	Infinite

(shown also graphically in Figure 2)

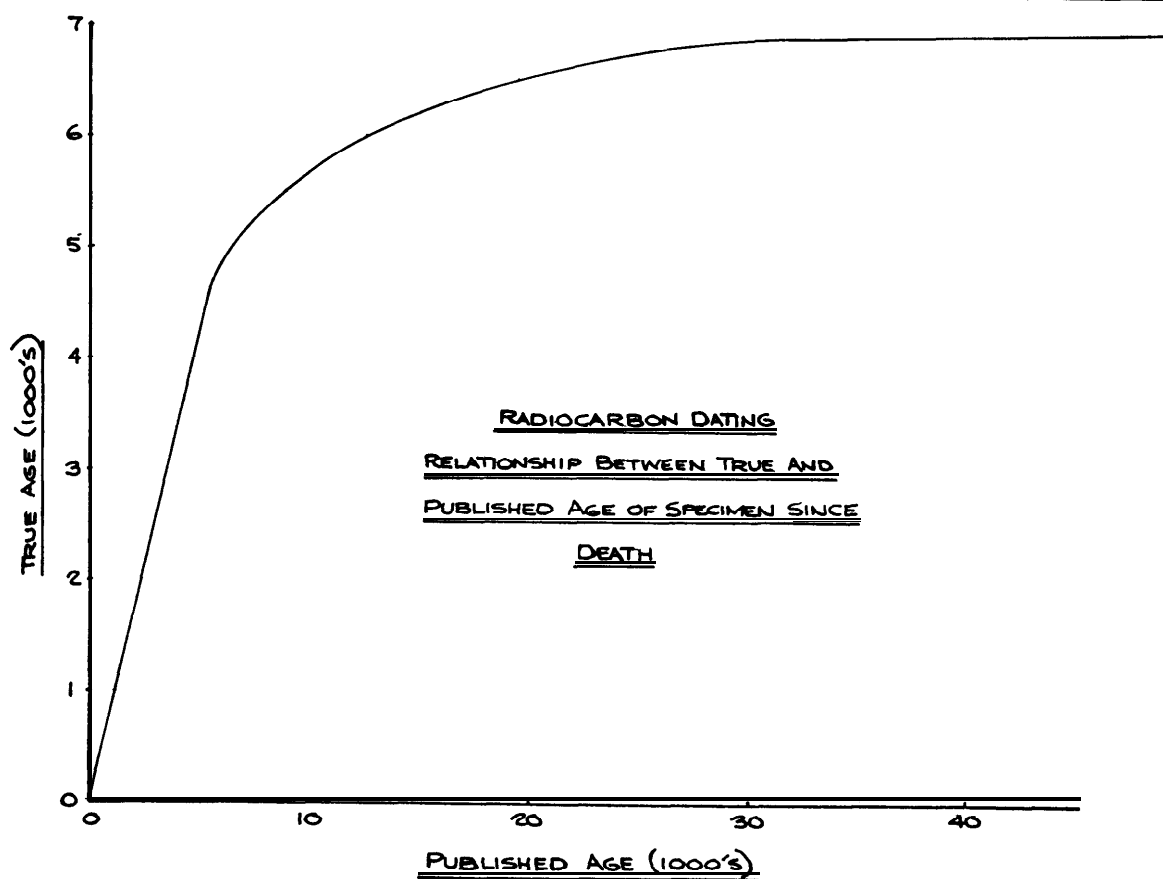


Figure 2.

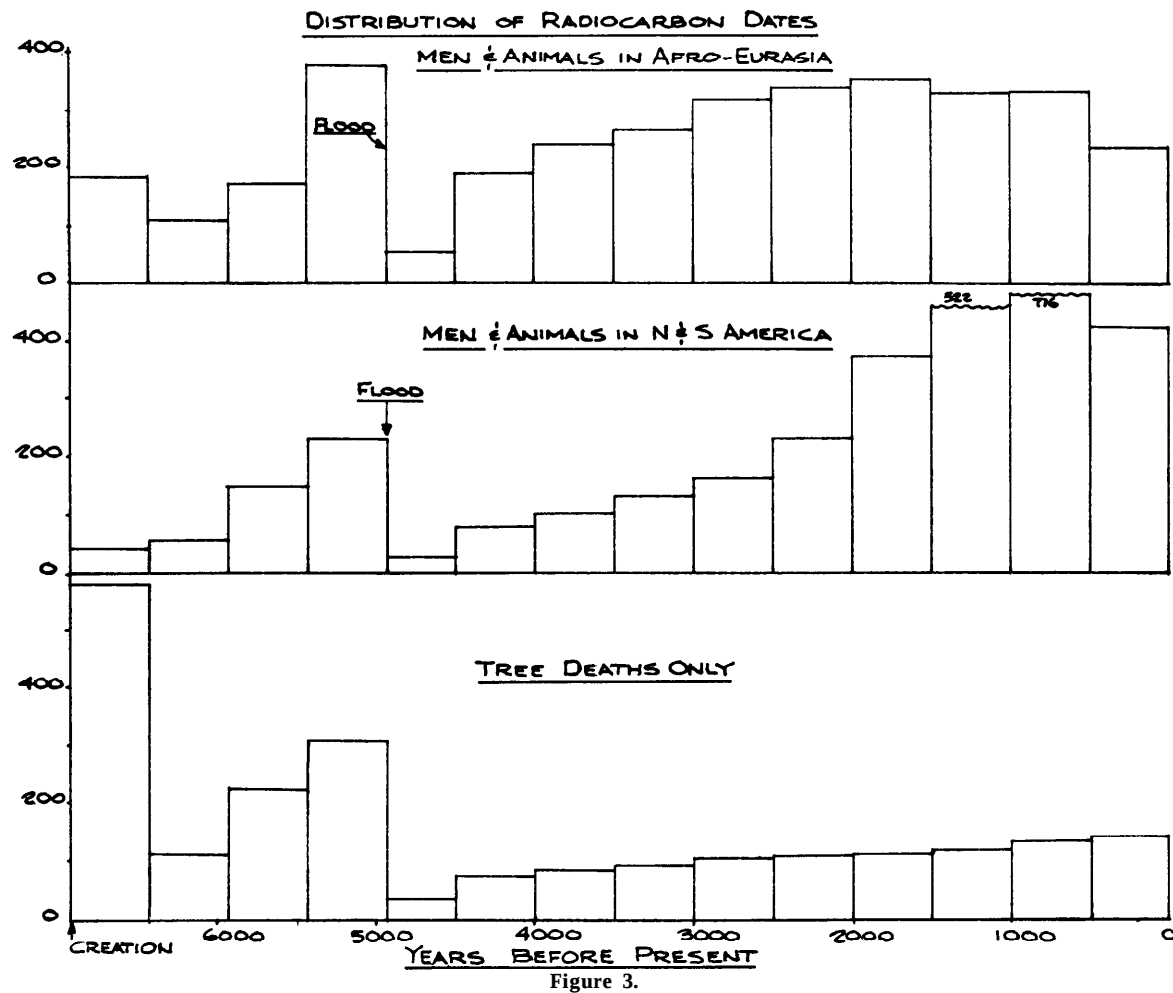


Figure 3.

Note the close correspondence between the true versus published age shown here and the initially corrected versus published age of Table 6, as far back as 5,000 B.P. This comes from the fact that Libby's figure of C-14 production fits the hypothesis quite well back to the flood. Prior to that a radically different production rate is necessary, as presented in Appendix A, which accounts for the rapid divergence of the two tables from 5,000 B.P. back to creation.

So much for the results of the hypothesis. The important thing is to test its truth. To do this, the argument is as follows: If the accumulated radiocarbon dates, corrected to true dates as above, disclose details concerning flood and creation that are only found in the Bible and that are in no way implied in the hypothesis itself,

it follows that the corrections to true age* in Table 7 are valid, the assumed C-14 production rate* is valid, Biblical Creation and Flood is confirmed, and the hypothesis is sound. This we now proceed to show.

Date Re-valued Hypothesis Verified

All the published dates were first reduced to those that are strictly independent, by eliminating duplications, multiple specimens at the same location, etc. The dates included all lists published, first in *Science*, and since 1959, in *Radiocarbon*, through volume 11, covering the year 1969, giving a total of over 15,000 dates. These independent dates were then classified as follows:

Class I: Dates pertaining to human occupation and ark-borne** animals found in the Afro-Eurasia land mass (3768 dates)

Class II: Dates pertaining to human occupation and ark-borne** animals found in the Western hemisphere (3550 dates)

*Granting any margin of error that would lead to the same conclusions.

**Ark-borne animals include all those specifically indicated by the Biblical record; i.e. all except sea-life, insects and smaller forms.

TABLE 8

DISTRIBUTION OF RADIOCARBON DATES IN 500-YR. AGE GROUPS SINCE CREATION

PERIOD IN YEARS B.P. (Before Present)	NUMBER OF DATES FOUND IN EACH PERIOD		
	CLASS I MAN & ANIMALS IN AFRO-EURASIA	CLASS II MAN & ANIMALS IN W. HEMISPHERE	CLASS III TREE DEATHS ONLY
0- 500	276	496*	154
500-1,000	384	803*	150
1,000-1,500	361	540*	119
1,500-2,000	357	391*	108
2,000-2,500	363	253	110
2,500-3,000	344	182	108
3,000-3,500	289	158	102
3,500-4,000	259	114	91
4,000-4,500	198	83	71
4,500-4,950 (Flood)	56	26	35
4,950-5,500	403	249	326
5,500-6,000	185	155	236
6,000-6,500	116	57	119
6,500-7,000 (Creation)	187	43	624
TOTALS	3768	3550	2353

*Dates in these three periods are abnormally numerous because of concentrated research by many universities in American Indian culture.

Class III: Dates pertaining to substantial trees (not low-lying vegetation) regardless of geographical location, but omitting wood associated with human culture, i.e. firewood, implements, etc. (2353 dates)

Class IV: Other dates of matter not clearly affected in time or distribution by a Flood catastrophe; i.e. oceanic flora and fauna, ocean bottom sediments and detritus, marl, loam, peat, tufa, gyttja, caliche, sapropel, leaves, sedge, grass, pollen, etc. (Approx. 5300 dates)

The 9671 dates in Classes I, II, and III were then corrected from published age to true age, in accordance with Table 7, and distributed into age groups, each group spanning 500 years.

In each case the published "mean" date is used, the probable error always being equally plus or minus. Dates published as "greater than 40,009," "greater than 33,090," etc., of which most were in Class III, were put in the next older group.

Finally, since Biblical chronology puts the Genesis Flood almost exactly 3,000 years before the death of Christ, or close to 4,950 years ago, all dates between 4,950 and 5,000 were arbitrarily put in the age group just preceding the flood, i.e. 5,000 to 5,500 B.P. The argument here is that,

(a) If the Biblical record is true as to the flood and its date, these would be death-dates of flora and fauna killed by the flood, and should therefore appear in the age group terminating at the flood, or

(b) If the Biblical record is untrue as to either the flood or its date, such an adjustment would be of no consequence to the results, since the deaths in such a 50-year span would be no more than in any other nearby 50 years.

Summarized Results of Data Analysis

Results of this classification are shown in Table 8, and plotted graphically in Figure 3. Even a casual study of this table and graph reveals the following significant facts:

Fact #1: The number of dates in *each* of the three classes shows a sudden drop from a large number in the period preceding the flood, to less than 15% of this number in the period immediately following the flood.

Fact #2: Class I dates (man and animals in Afro- Eurasia) commence fairly large (187), fall off to 116 in the next 500 years, and then build up to a peak of 403 just before the flood. After the marked drop-off at the flood, they build up again to a similar peak within the last two millennia.

Fact #3: Class II dates (man and animals in the western hemisphere) are considerably more scarce than Class I dates immediately after both creation and flood, and are slower building up after each event. Unlike Class I dates, they show no drop-off after creation.

Fact #4: Class III dates (tree deaths) are by far most numerous (624) at the beginning, then drop off to 20% in the next period, rise again to 326 before the flood, and then drop to a mere 35. After the flood, these dates slowly build up again, but never are more than 25% of their post-creation value.

Now if we analyze the dates in the periods immediately following creation and flood we discover additional facts of even further significance:

Fact #5: In the first 500 years following creation the dates found in Class I break down as follows: 75% are of animal deaths, 22% are of human culture (i.e. fire-sites and tools, etc.) and only 3% are of human deaths. What is more, the oldest human dates are in the Near East.

Fact #6: In the first 500 years following creation, the 43 dates in Class II are of two kinds only: 90% animal deaths, and 10% human culture. There are no identifiable human death dates.

Fact #7: In the 450 years immediately after the flood, the 56 dates in Class I break down as follows: 37 of animal deaths, 12 of human culture, 7 of human deaths. Again, the Earliest dates are most frequent in the Near East!

Fact #8: In the 450 years following the flood, the mere 26 dates of man and animals in the western hemisphere (Class II) are made up of 20 animal deaths, 5 cultural deposits, and 1 human death date whose margin of error could put it at the flood. (Here we see man's late arrival in the west after the flood, just as Fact #6 suggests his late arrival in the west after creation!)

Fact #9: The 35 tree-death dates (Class III) in the 450 years after the flood are mostly from temperate and tropical zones. Dead trees from polar regions almost exclusively date before the flood, and no redwood (sequoia) deaths are found in the first post-flood period except those associated with volcanic action or lava flow.

Comparison of Facts to Biblical Record

Against these nine facts we now compare the Biblical Record. We read of an original world of evident verdure, beauty and abundance; of animals and reptiles of all kinds, vegetarian in habit, populating the earth undoubtedly in ecological equilibrium; and of a human race com-

mencing with an intelligent man and woman, somewhere in the region of Mesopotamia, to whom the animals were instinctively subservient.

We then read of a "fall" and a "curse" with three physical consequences, principally: as to **fauna**, some animals became carnivorous and preyed upon each other; as to **flora**, thorns and thistles are mentioned, suggesting possible climatic as well as ecological disturbances; and as to **man**, violence and greed appeared, while at the same time he lived to great age, 900 years not being uncommon, so that apart from infection and disease few deaths should appear for the first 500 years.

Over the next 2,000 years we are told particularly of violence, murder and rapacity among mankind; yet there is equal emphasis upon the prolific growth of the human race. Whether the American continents were contiguous with Africa and Europe at this time we cannot tell. Regardless, there was ample time, intelligence and incentive for the human race to spread to the Americas, Australia and the islands of the Pacific, and even develop an "advanced" culture.

The record is not of ignorant or "primitive" men. We read of artificers in brass and iron, of agriculture, of animal husbandry, of tents (suggesting spinning and weaving) and of sophisticated musical instruments such as harp and organ—a far cry from African tom-toms! There is also archeological evidence of written language, numerology, and extensive libraries in clay tablets in this period.

Suddenly we are told of a worldwide cataclysm of awesome and frightful detail; a cataclysm in which **all** of mankind, all land animals and all birds are destroyed, save those uniquely preserved in a great ship previously built by one family at Gods explicit instructions. The cataclysm is clearly described as the rapid inundation of the entire earth, probably by tectonic or volcanic upheaval of the ocean floor ("fountains of the great deep") accompanied by or causing great rain ("windows of heaven").

Vast and violent changes of the earth's surface, stripping of the luxuriant vegetation, and sudden entombment of desperate men and animals must have occurred, all to vanish beneath strata upon strata of sediment and lava, just as the geological record attests. (See References 11, 12, 13).

Only after some 375 days do the waters abate sufficiently to permit the survivors to leave their floating refuge; four men, four women, a male and female pair of each "kind" (not species!) of animal, and in a few special cases, seven of a kind. And from that spot, somewhere in the

mountains of Ararat, those survivors alone repopulated the ravaged earth. At the same time vegetation slowly returned, first the grass and shrub, then the fast-growing saplings, and finally the slow oak and giant sequoia, but now in a world of vastly different climate and terrain.

All of this is a story well-known to many. Yet it bears re-telling here to bring out the dramatic way that the above details and the radiocarbon record correspond. The sophisticated modern mind, no matter how predisposed to dismiss the story as folklore and myth, is thus confronted with the inescapable fact that: (1) the Biblical record is corroborated by each of the nine facts listed above discovered in the distribution of the radiocarbon dates, and (2) *not a single detail* of this record, nor even its chronology, is found in conflict with the age and distribution of the thousands of dates now available.

Further Consideration of Stated Hypothesis

We now return to the hypothesis being tested; the hypothesis that, *knowing* there has been a recent creation, it is probable it occurred when the Bible says it did, i.e. about 7,000 years ago; and secondly that, *knowing* there has been a world-wide catastrophe to man and animals, it is probable it corresponds in date with the Genesis Flood, i.e. about 4,950 years ago,

Making these two assumptions, a C-14 production rate in time past was established. With this rate, a correction from published to true radiocarbon ages was obtained; and with these true ages assigned, the distribution of radiocarbon dates disclosed nine facts. The question before us then is simple. Were the nine facts automatically predetermined regardless of what dates had been chosen for creation and flood; or do the nine facts result *only* if we assume the Biblical date for each of these events?

If the former statement is true, we have merely deceived ourselves with circular reasonings—just as evolutionists have done in assuming evolution to date index fossils to date rocks to date fossils to prove evolution! But clearly this is not so in our case.

There is nothing whatsoever in the choice of the two numbers, 7,000 and 4,950, which predetermined that the radiocarbon dates would distribute themselves so as to correspond with the *details* of both Biblical Creation and Biblical Flood. Yet unmistakably they do.

It follows then that the hypothesis is in accord with the accepted criteria of the scientific method by which one derives a general truth from a particular set of facts by testing the truth against the facts.

It follows also that the hypothesis is confirmed, along with the details of the Biblical record and

Biblical chronology, within the limits of accuracy of the radiocarbon data.

It is granted that a variation in creation date of ± 400 years would probably not affect the distribution of dates in a manner out of harmony with the Bible. On the other hand, a variation in the flood date as much as 100 years *older* would show noticeable discrepancies between the date distribution and the details of Scripture. It is also worth noting that the flood date of 4,940 B.P. established from Biblical chronology leads to a date of the Exodus at 3,240 B.P. or 1,470 B.C. agreeing with both radiocarbon dates and other investigators (See Reference 13).

It is also granted that the paucity of unambiguous radiocarbon dates in some of the groups cited in the "nine facts"—as well as the large probable error in many of the older dates—taken by themselves would make solid conclusions difficult. However, by the very laws of statistical data, this is a weakness which must diminish with time as thousands of new dates accumulate each year.

And the thesis of this paper is that the number of good dates already available is sufficient to *point to*, the conclusions now to be drawn; while the number of dates with large uncertainties is insufficient to invalidate these conclusions, particularly when the Bible—a body of evidence not lightly dismissed—supports the same conclusions.

Conclusions

In the light of the above facts and reservations, it is concluded that:

1. Radiocarbon supports the idea of Biblical Creation by pointing unmistakably to a recent beginning of cosmic radiation.
2. Radiocarbon supports a date of creation at approximately 7,000 B.P.
3. Radiocarbon supports the contemporaneous appearance of all forms of living matter at creation. Man and modern animals, along with extinct flora and fauna all appear equally ancient and with equal suddenness, as shown in Table 4.
4. Radiocarbon supports the beginning of the human race from a few ancestors in the vicinity of the Near East.
5. Radiocarbon, on the other hand, indicates the sudden concurrent appearance of the rest of the animal kingdom in larger numbers in every part of the world.
6. Radiocarbon clearly indicates an original world in which both trees and low-lying vegetation were profuse and widespread even throughout present polar regions and deserts. (Facts amply attested by geology and paleontology of

an ancient world uniquely different in climate, in location and elevation of the very continents, and possibly even in the inclination of the Earth's axis!)

7. Radiocarbon points to some drastic change, shortly after creation, which depleted both animal world and arboreal vegetation, but without noticeable effect upon the multiplication of man; just such an effect as might be deduced from Genesis 3.

8. Radiocarbon clearly points to a world-wide catastrophe destructive of man, beast and tree, just as described in Genesis 7 and confirmed elsewhere in Scripture, in worldwide human tradition, and in world-wide geological evidence.

9. Radiocarbon supports the date of such catastrophe at about 4,950 B.P. (Compare Tables 5 and 8)

10. Radiocarbon indicates a large and wide-spread human population in the world just before this catastrophe.

11. Radiocarbon indicates the widespread existence of now-extinct flora and fauna in the world before this catastrophe, including evidence of the gradual extinction-of many forms during the two millenia between it and creation. (Table 8)

12. Radiocarbon indicates that the "re-origin" of both animals and man after this catastrophe was in the vicinity of the Near East, and noticeably later in the western hemisphere.

13. Radiocarbon supports the Biblical chronology of ancient empires and of Israel and exposes suspected exaggerations in Manetho, Berossus, et al.

14. Finally, there is no question as to which concept of Time and History is supported by the radiocarbon record. Is it the endless time and meaningless history postulated by evolution? Or is it a specific span of time marked off by the purposeful acts of a sovereign God, from creation to flood to cross to ultimate consummation, as the Bible portrays?

Fifteen thousand radiocarbon dates, dead voices from the past assembled by scientists from every kind of once-living matter and every corner of the globe, now answer the question unequivocally in favor of the Bible!

APPENDIX A

ANALYTIC DETERMINATION OF THE VARIATION IN C-14 PRODUCTION RATE, AND OF THE RELATIONSHIP BETWEEN PUBLISHED AND TRUE RADIOCARBON DATES.

In the body of the report, grounds were established for the working hypothesis that (a) cosmic radiation commenced about 7,000 B.P. (true date), and (b) the significant drop-off

in specimens of man and animals at published dates about 6,000 B.P. actually occurred at a true date about 4,950 B.P. With this hypothesis it is possible to determine the most probable variation in C-14 production rate in time past; and with this variation it is possible to correct published dates to true dates. As shown in the report, the results confirmed the hypothesis.

Here it is necessary to show first the determination of the most probable specific production rate (hereafter called SPR) of C-14, in time past. Three alternatives are considered:

- (1) A constant SPR throughout history, such as Libby assumed, but at a value high enough to yield the hypothetical creation date, 7,000 B.P., rather than the 15,700 B.P. which results from Libby's SPR of 18.8 atoms/min-gm. Such an SPR value comes out (using equation 1 below) at 27, for $t = 7,000$, and was proposed in 1968 by the author.¹⁴ Such a constantly high SPR, leads to unreasonably large corrections to the published dates, as follows:

Published age:

1,800 3,805 5,090 9,020 12,580 19,180

Corrected age:

1,000 2,000 3,000 4,000 4,950 6,000

Equally serious is the objection that the published date corresponding to the flood date of 4,950 would be 12,580, since no noticeable drop-off in published dates of man and animals occurs at this point. Since this does not satisfy the hypothesis, this alternative must be dropped.

- (2) An SPR value highest at 7,000 B.P. and decreasing either linearly or exponentially to Libby's value at present. This alternative suffers from the same objections as (1), with the additional objection that no mechanism is evident in the carbon-exchange reservoir, or in cosmic radiation, to account for such a steady decline.
- (3) A two-step SPR, as shown in Figure 1, with a constant effective value of P_1 from 7,000 to 4,950 B.P., and a lower value of P_2 from 4,950 to the present.

To determine these two values we apply first the standard equation for buildup of specific activity, A_1 , in the biosphere during the time from 7,000 to 4,950 B.P.:

$$A_1/P_1 = (1 - e^{-\lambda t}), \text{ for } 0 < t < 2050 \quad (1)$$

Then for the second period we apply a similar equation,

$A_2/P_2 = (1 - e^{-\lambda(t + \Delta)}), \text{ for } t > 2050 \quad (2)$ where λ in both equations is .693/5730, and Δ is the increment of time *before* $t = 0$, that would have been needed for A_2 to build up under the influence of P_2 to the same value

as A_1 at time $t = 2050$, i.e. the specific activity of the biosphere at the flood (Note: A_1 and A_2 must fall on a single curve A as shown in Figure 1).

To solve equation (1) and (2) for P_2 , P_1 and A , we need three boundary conditions which are: $A_1 = A_2$ at $t = 2050$; $A_2 = 16.0$ (today's value) at $t = 7,000$; and a final condition that the discrepancy between a published age, L , and a true age, T , should be about 1,000 years at $t = 2,050$ years, since the drop-off apparently caused by the flood (by our hypothesis) occurs in the published dates with that error. Looking again at Figure 1, the two ages, L , and, T , are further defined by:

$$D/A = e^{-\lambda T} \quad (3)$$

$$D/PL = e^{-\lambda L} \quad (4)$$

where D is the specific activity, dpm/gm., of a specimen today of true age, T ; A is its activity when it died, lying on the A curve (Figure 1) T years ago; PL is 16.0 at/min-gm, the SPR equal to today's specific activity which Libby and all investigators assume to be activity when a specimen died; and $\lambda L = .693/5570$, the original Libby decay constant, still used for dating.

Following the above procedure, the value A came out at 9,400 years, and the two values of SPR, $P_1 = 64.4$ and $P_2 = 18.6$ atoms/min-gm. The latter value is very close to Libby's value for the SPR today, which is as expected.

This third alternative thus fits the conditions required at creation and flood, and the ($L - T$) corrections that result have been shown in the body of the report (Table 7) to produce remarkably satisfactory confirmation of the hypothesis. Despite this confirmation, there is still need to show what might have caused such a drastic decrease in SPR from 64.4 to 18.6, that is, from SPR of pre-flood to that of post-flood era, respectively.

To account for this decrease it is first noted that Libby determined the value of $P_2 = 18.8$ atoms/min-gm as the ratio of two other values, each determined experimentally. The numerator is neutron production, via cosmic rays, per unit area at earth's surface, on the showing that each free neutron almost certainly produces an atom of C-14. This numerator value, allowing for altitude and latitude variations, came to 156 atoms/sq. cm.-min.

The denominator of this ratio giving P_2 is the total inventory of *exchange-carbon* per unit area of earth's surface, i.e. the carbon that actively participates in the great carbon-exchange

process on earth. This inventory Libby subdivided as follows:

Ocean carbonate	7.25 gm/sq. cm.
Ocean, dissolved organic	.59
Total biosphere	.33
Atmosphere	.12
Total	8.3

Now consider the principal effects of a cataclysm such as the Genesis Flood on the principal items in this inventory. Undoubtedly the Flood demolished the carbon-exchange inventory in the terrestrial biosphere. Moreover, it is clear that the continents, since the flood, have recovered scarcely one-third the wealth of living matter they once had.

Allowing then for the less disturbed inventory of marine life, we may judge the pre-flood biosphere inventory to be .50 gm/cq. cm. Likewise the pre-flood atmospheric carbon inventory would be slightly less than now, say 0.10, due to the enormous competition of vegetation for CO_2 .

We must look then for some entirely different action of the flood which would greatly *increase* the carbon-exchange inventory of the oceans, and it is not hard to find. On the verdure-rich continents was the accumulated animal and vegetable detritus of two thousand years, over 99% of it inert to the carbon-exchange cycle.

While much of it entered into formation of coal, peat and oil, the greater mass by far must have been rolled and swept into the world ocean; thus, suddenly "enriching" the sea with organic detritus many times previous concentration, an inventory which in this new environment and at new temperatures could now actively participate in the carbon-exchange process to this very day.

We may thus readily postulate a pre-flood carbon-exchange inventory as follows:

Ocean carbonate	1.70
Ocean dissolved organic	.20
Biosphere	.50
Atmosphere	.10
Total	2.50

The total here of exchangeable carbon before the flood (2.50 gm. per sq. cm.) is significantly lower than the present value indicated by Libby, 8.3 gm/sq. cm. This does not indicate that the flood somehow increased the absolute total amount of carbon on the earth, but that it increased the *exchangeable* carbon.

As suggested previously, the flood might be expected to carry much of the accumulated vege-

(Continued on Page 83)

UNIVERSITIES AND COLLEGES HAVING THE CREATION POINT OF VIEW

WALTER E. LAMMERTS*

History, Philosophy, and Purpose

Following the famous Scopes Evolution Trial and the death of William Jennings Bryan in Dayton, Tennessee, in 1925, Bryan College was founded as a memorial to the faith of "the great commoner," and opened its doors to the first students in 1930. As an independent, nonsectarian, Christian institution, Bryan College emphasizes historic Christian orthodoxy rather than the doctrines of any particular denomination.

"Christ Above All" is not merely a motto at Bryan College but is intended to be a living present reality, exemplified in the spiritual, mental, and physical development of the student. Bryan's purpose as an undergraduate institution, is to provide a liberal education in the arts and sciences, presenting the Christian view of the world in the light of Biblical and natural revelation to qualified students, regardless of sex, race, creed, color, or national origin. The educational objectives of the College are:

To develop in students an understanding and appreciation of the arts and sciences;

To guide students in developing interests and skills consistent with their abilities;

To encourage students to think critically, to work independently, and to express themselves creatively in their search for truth;

To provide students with a foundation for graduate study or their chosen vocation;

To foster in students wholesome attitudes, healthful habits, and responsible citizenship.

Educational Standing

Bryan College is accredited by the Southern Association of Colleges and Schools and is approved for teacher education by the Tennessee State Board of Education, with approval of certification programs by many other states. Bryan is a member of the Association of American Colleges, Tennessee College Association, and Council for the Advancement of Small Colleges, is listed in the annual U.S. Office of Education Directory; and is approved for the training of veterans and foreign students.

Location and Facilities

Bryan's 100-acre wooded hilltop campus overlooks Lake Chickamauga and the city of Dayton, in the world-famed Tennessee Valley, 38 miles north of Chattanooga on U.S. Highway 27, a

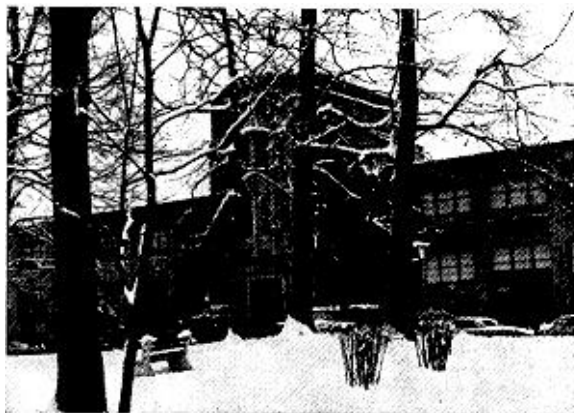


Figure 1. The main building of Bryan College, as viewed through the trees of the hilltop wooded campus which occasionally enjoys a wintry blanket of snow.

major north-south highway. The central campus building houses the administrative and faculty offices, all-new classrooms and laboratories, library, student center, kitchen, and dining room.

Student housing includes three campus facilities: two 100-student, air-conditioned dormitories, and a recently renovated dormitory on the lower floor of the chapel building, housing 28 students; and one newly renovated, off-campus dormitory, housing 45 students. Other principal campus buildings are the music building, gymnasium, chapel, maintenance building, five faculty-staff residences and the official college residence.

Married students are accommodated in privately owned apartments near the campus or in town. The college food service, under the direction of Professional Food-Service Management, features professional chefs, modern kitchen and cafeteria facilities, and an air-conditioned dining room.

Student Body, Costs, and Financial Aid

The unduplicated enrollment for first and second semester of 1969-70 was 359, representing 35 states and several foreign countries from some forty denominations.

The basic cost for a full-time dormitory student for the 1970-71 academic year of two semesters will be \$1,996. This covers room (\$400), board (\$576), and tuition (\$1,020), one half of which applies to each semester. The tuition includes the general student fee, as well as course and laboratory fees.

*Walter E. Lammerts, well known rose breeder, holds the Ph.D. degree in Genetics from U.C.L.A.

Student aid is available to students who qualify on the basis of academic and citizenship merit and financial need as determined from an objective evaluation by the ACT Family Financial Service. Student aid is of three kinds: (1) scholarships and grants; (2) loans; and (3) employment for which the prevailing wage rates are \$1.30 to \$1.50 per hour, with an average work load of 8-10 hours per week.

Educational Program

Both the Bachelor of Arts and the Bachelor of Science degrees are offered, with majors in the fields of Bible, biology, Christian education, business administration, business education, chemistry, elementary education, English, Greek, history, mathematics, music, and music education. A total of 124 semester hours are required for a degree, representing an average load of 16 hours per semester for four years. A student may advance more rapidly toward a degree by taking courses during Bryan's summer sessions.

Bryan's curriculum provides a variety of course offerings in the six academic divisions of the college: Biblical studies and philosophy, education and psychology, history and social science, fine arts, literature and modern languages, and natural sciences. The division of natural science aims to acquaint the student with the physical and biological realms.

Studies involve the use, in most departments, of direct observation and experimentation in the laboratory or of field situations. The curriculum is designed to provide a general preparation in the natural sciences and also help meet the needs of prospective teachers and pre-professional students.

Division of Natural Sciences

Dr. Willard L. Henning, professor of biology, serves as chairman of the natural science division, and head of the department of biology. He holds the Ph.D. from Ohio State University. Assisting Dr. Henning in the natural science division are Russell Porcella, instructor in biology; Lloyd Matthes, assistant professor of mathematics and head of the department of mathematics; and Dr. Walter Bauder, associate professor of chemistry and head of the department of chemistry. Mr. Porcella, an alumnus, holds the M.S. from the University of Tennessee, and is enrolled in a Ph.D. program at the University of Tennessee. Mr. Matthes, also an alumnus, holds the M.Ed. from Illinois State College. Dr.

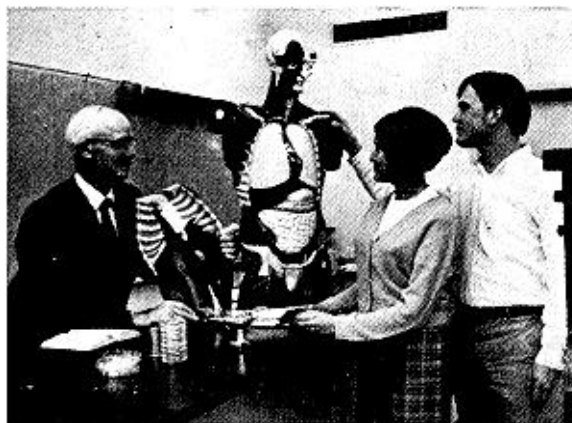


Figure 2. Dr. Willard Henning, head of the biology department, explains to two students the intricacies of human anatomy with the use of a life-size model.

Bauder holds the Ed.D. in science education with a specialty in chemistry from the university of Georgia.

The personal experience of the head of the division very naturally is reflected in the philosophy and teaching of the division. Dr. Henning writes:

Whereas I was taught the theory of evolution as the only explanation for the origin of life and of the many kinds of animal and plant life during my many years of training at large universities, I knew the theory could not explain many serious gaps, and could not explain how extreme complexities of life came about. The evolutionist's reply was always "just wait until we make more discoveries, or probe deeper into the chemistry of life," or some such answer.

It was after I truly found Christ as my Savior during World War II that I came to realize that the beginning of all things is clearly stated in the first chapter of the Book of Genesis. I realized that Jesus Christ Himself referred to this account as authoritative.

Even though many details are omitted in the Biblical record, as they are also on how the bodies of Lazarus and of Jesus Himself were resurrected, yet it is "through faith we understand that the worlds were framed by The word of God, so that things which are seen were not made of things which do appear" (Hebrews 11:3). Through this same faith I believe and wholeheartedly accept the cardinal doctrines of the Christian faith and the authority of the Holy Bible as the inspired Word of God.

THE TROPICAL GECKO—A CEILING WALKER

WILLARD L. HENNING*

Ever since man of tropical climates lived in rooms with smoothly plastered ceilings or walls he has been fascinated by geckos as they rapidly scamper across such surfaces. These mostly tropical lizards are nocturnal, usually less than six inches long and with a vertical pupil of the eye. Their ability to capture insects in inaccessible places after dark suggests they may be of some benefit to mankind.

The author is indebted to Joseph F. Gennaro, Jr. and his article "The Gecko Grip" in *Natural History* magazine¹ for the following information on the Malayan *Gekko gekko*. This species moves rapidly on undersides of ceilings that may be polished, or of glass, plaster, concrete, etc. For years scientists have sought a satisfactory explanation for its amazing ability to cling so tightly and also to release so quickly.

The presence of suction cups was assumed but microscopic examination revealed only many fine filamentous mop-like structures. This led to the belief that the thread-like structures clung to rough places on any surface. This idea was not entirely satisfactory.

Detailed Examination

Detailed explanation was found only when the submicroscopic structures were examined with the electron microscope. The ventral surface of each toe has V-shaped cross ridges with the "V" pointing toward the palm of the foot. Along the outer ridge is a fringe of very fine bristle-shaped structures, each with a tremendous number of branches.

Gennaro reports that each bristle has 2,000 or more extremely small branches. Careful examination with the electron microscope demonstrates a thin-walled suction cup apparently attached slantwise near the tip of each. The actual diameter of each suction cup is listed as 2,000 Angstroms or 0.2 of a micron, which is slightly below the size such objects can be seen clearly with the best light microscope.

Obviously the combined strength of thousands, or possibly millions of suction cups, accounts for the effective "grip" that has been demonstrated. Probably parts of some suction cups may adhere partly to others, thus providing a combined effect.

Release Method Required

However, an efficient release method must be provided, or else the cups would be severed and lost. The explanation is found in that each branch supports its suction cup somewhat slant-

wise at the time the grip is made. Thus if the branch and bristle is drawn to an erect position or in an opposite angle the suction cup will be readily pulled loose from one side first.

Superficially it is observed that during release the tips of all toes are first lifted and gradually curved upwards and backwards. The details of the extensor muscle attachments were studied by the German zoologist Dellit in 1949. He found that the extensor muscles (that lift tips of toes) which originate on the dorsal sides of the digital bones have their attachments on the inside of the skin at the tip of each toe. This explains the lifting of each toe which provides release of suction cups successively as indicated previously.

Obviously such submicroscopic suction cups and their control is referred to as a highly specialized adaptation. How could such structures and their functioning and control ever have developed by mere chance mutations from the simple scaly feet of supposed ancestors? Only a few suction cups, or even several on each toe would be of no value without an adaptation providing simultaneous rapid release of all cups on all toes, considering the speed geckos run on smooth ceilings.

Only One Unchanging Answer

The inspired Word of God provides the only satisfactory explanation for not only the origin, but also for the functioning and control of such grasping feet. In Genesis 2:19a we read, "And out of the ground the Lord God formed every beast of the field and every fowl of the air." Psalm 94:9b says, "he that formed the eye, shall he not see." Surely the human eye is even more complex than probably most if not any other organ of either man or lower animals.

The steps in the process of special creation of the human body such as forming substances of the body from raw materials forming them into organs and organ systems according to pattern are stated clearly in Psalm 139:15, 16: "My substance was not hid from thee, when I was made in secret and curiously wrought in the lowest parts of the earth. Thine eyes did see my substance, yet being unperfect; and in thy book all my members were written, which in continuance were fashioned, when as yet there was none of them."

Surely the master mind of God and His skilled hands were essential for creation of everything that now exists, both small and great. (John 1:9)

Reference

¹Gennaro, Joseph F. Jr., August-September, 1969. *Natural History*, 78 (7): 36-43.

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COMMENTS ON SCIENTIFIC NEWS AND VIEWS

HAROLD ARMSTRONG*

Proponents of a theory, which has become popular recently, hold that the earth's magnetic field has reversed many times in the past. This has left rocks magnetized in different directions. In particular, where the ocean floors are believed to have spread, there are strips of different magnetizations, supposed to have formed at different times.

It is claimed that the earth's magnetic field was constant through much of the Cretaceous period, but has changed many times in the Tertiary.¹ Now we have mentioned in previous issues certain things that lead to the interpretation that the end of the Cretaceous (by the common reckoning) might really indicate the flood. Can we make this fit together?

Cause of the earth's magnetic field seems to be unknown, but currents in the ionosphere seem to have an effect on it. Now the canopy, before the flood, must have had a very great effect. It took some time in collapsing and falling, and while this was going on its magnetic effect likely changed and fluctuated.

Moreover, given some magnetic field, the motion in large bodies of water should set up electromotive forces, which would cause electrical currents, which would modify the original magnetic field. Under present conditions the motions are restricted, but they were likely very great when the whole earth was covered with water, and there were no obstacles to currents. Under these circumstances, there could well have been very complicated magnetic happenings.

It is stated that there is evidence in some places of 171 reversals of the magnetic field. Is this not oddly like the number of days for which the earth would have been completely covered with water, as if there might have been a *daily reversal*?

Some recent discussions² indicates that this matter is not as simple as it may once have seemed; that is "... the present tidy state of the subject ... (is) about to end ... we could expect chaos to be re-established. ...". Complications might include, e.g. "... detachment of blocks of normally magnetized crust and their eventual foundering amid younger crust showing a reversal pattern of perhaps a different orientation."

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It has been reported that there are "... lunar semi-diurnal variations of the vertical component of the geomagnetic field ... likely mechanism ... is the generation of electric currents in the sea due to tidal movements of the sea across the geomagnetic field."³

It was suggested in the above section that some such effect, but much stronger, could have happened during the Flood, when there were no obstacles to the motion of the water. This might have to do with the reversals of the earth's magnetic field, which are believed to have taken place in the past. From the reference, it would appear that motion of the water can certainly affect the matter.

Incidentally, recent investigations seem to show that of all the "solid" heavenly bodies which can be studied to any extent; viz.: Mercury, Venus, Mars, earth, and moon, only the earth has an appreciable magnetic field. And earth is the only one which has an ocean. Of course, the surface of Venus cannot be seen, but all the evidence seems to show that Venus is dry. Is there not likely to be some connection between these two facts?

Comments Mt. Ararat Expedition

Since this note was begun, essentially the same story has appeared in a number of places. Many readers may have noticed the account in *Christianity Today*.⁴ There a few more details were given.

Men involved include Fernand Navarra, who found pieces of wood at the same place in Turkey in 1955, Harry Crawford, Fred Lee, and Ralph Lenton.

It appears that the wood was found on Mt. Ararat at a place where water flows out from under a small glacier, as if the wood might be from something buried under the glacier. Another expedition is planned, it is said, and the men hope to try some digging into the glacier.

It is too soon for those of us who are not on the spot to form any very definite opinions about this matter. It seems quite possible that, if the ark was buried in ice not too long after the flood, it might have been preserved all this time. On the other hand, since names sometimes remain the same while the places to which they apply change, it is not at all certain that the mountains of Ararat in Genesis are the same as what we call Mt. Ararat today.

Two points, however, are worthy of notice. Our Lord said: "As it was in the days of Noe, so shall it be also in the days of the Son of man."⁵

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Now one of the features of the days of Noah was that the ark was manifest to the world. If, then, it should once more become manifest, is that not another sign warning us that the days of the Son of man are at hand? Granted, that was not the main point of Jesus' statement; but His words have a way of coming true, not only in respect to their main point, but also in respect to what seem to be very minor points.

If the ark should be discovered, are we to expect a great increase in belief as a result? Alas, it is much more likely that it would be explained away, or hushed up, or just ignored. Our Lord said in another place: "If they hear not Moses and the prophets, neither will they be persuaded, though one rose from the dead."⁶ Nor, it is to be feared, will many, who have already stopped their ears to Moses and the prophets, be persuaded though the ark be uncovered from over four thousand years of burial.

On Studies of Religious Experience

It is reported recently⁷ that a research unit has been established at Oxford "for the scientific study of religious experience." Methods to be undertaken, and findings hoped for, are not made very clear. However, it may be significant that the article mentions, apparently as something along the same line, that there is an Occult Society at Birmingham University. Some of the members, it is said have affiliation to churches.

Perhaps we should find this of interest, but we shall probably have some misgivings. "Religious experience," we may suspect, will usually not mean the experience of living for fifty or sixty years according to God's will. (As St. Polycarp so well put it.) Nor does one expect to find the main interest to lie in study of proofs of God's existence, such as Aristotle, St. Anselm, or St. Thomas Aquinas devised.

What people must beware, in things like this, is falling into a new Gnosticism. We have been warned that there will be things which, if possible, would deceive the very elect. (Matthew 24:24). As one precaution, it would be well to remember the tests in I John 4:2 and 3.

Research Might Relate to Canopy Concept

Two works, which recently came to my attention, might interest some. The first is a review article: "The Solar-Terrestrial Environment—an Historical Survey" by V. C. A. Ferraro.⁸ There are many interesting facts. For instance, I found that the notion that the aurora is due to the reflection of sunlight off polar ice-sheets, which I had heard when I was a boy, but did not suppose that anyone took seriously, was evidently proposed seriously in the last century.

There is much discussion of the "solar wind" and such phenomena. In particular, there may be some information here which will have a bearing on the theory of the canopy before the flood.

The second work is a book: *Physics in Meteorology* by A. C. Best.⁹ This is of interest in showing just how complicated the world around us is; and the discussions of the formation of raindrops, atmospheric electricity, etc., may again have a bearing on problems connected with the canopy.

Cycles, Canopy and the Flood

A recent article,¹⁰ and comments on it,¹¹ in the *Prophetic Witness*, an English millennial publication, might be of interest. It is suggested that the solar sunspot activity, and things related thereto, go in cycles (at least some of the cycles are, of course, well established), and that there are, in particular, three cycles, of periods about 11, 80, and 400 years respectively.

The active point of all these cycles seems to have coincided in 1968, and the previous coincidence, by a simple calculation, would have been about 4400 years ago. Now 4400 years ago is very close to the time of the flood, by the usual chronologies. It is suggested, in fact, that the coincidence at that time may have had something to do with the flood.

Let us follow that suggestion up a little. Suppose that, as seems at least a good working hypothesis, before the flood much of the water which is now in the oceans was in the canopy. The outburst of radiation, at the peak of the cycles, did something to trigger the precipitation of the canopy.

We know that in Wilson's cloud chamber, e.g., radiation causes ions on which droplets of water form. Maybe something similar happened to the canopy, and the process, once started, continued.

At the same time, the solar activity caused magnetic effects (as it still does), possibly augmented by what was happening to the canopy. These may have triggered earthquakes, which started the breaking up of the fountains of the great deep. And so the flood was under way.

In suggesting such a course of events, I am not suggesting that the flood was not a judgement from God, and sent by His will. But He may, and often does, choose to work partly within the course of nature. Since there is now no canopy, we were not, of course, in so vulnerable a position in 1968.

It may be that this pattern of thought, followed up, would give us some more notions about the course of events during the flood.

On the Changing Ideas of Men

An address by F. Hoyle, who has pleaded so strongly the cause of "continuous creation," might be of interest.¹² It deals with "highly condensed objects," i.e., white dwarf stars, neutron stars, etc.

He spoke of "... large red-shifts, which do not arise from the expansion of the Universe ... Sargent has found a grossly discrepant red-shift in one galaxy ...". These effects, it is suggested, arise from gravitational effects, due to very condensed matter and quite outside our experience, so that

... the behaviour of sources cannot in any case be explained in terms of conventional physical theory ... the implication is that physical theory (as applied to this problem) is wrong. ...

He goes on to urge that, contrary to what conventional theory might suggest "... matter ... does not collapse into singularities (i.e., small regions of infinite density) ..."; and that if there are no singularities then there should be no "big-bang" theory.

He quotes a suggestion by Jeans that the arms of spiral nebulae may be "... the seat of types of force entirely unknown to us ...".

Hoyle still seems to support "continuous creation," but now possibly in localized sources under very special and unusual conditions.

Aristotle, in his "On the Heavens" quotes Empedocles, who spoke of some of the theories of his time as "... the vain tale told by many a tongue, poured from the mouths of those who have seen but little of the whole." Is this not remarkably like what Hoyle is saying?

Anyone would agree that, given two rival theories which work, we should choose the simpler. But we have just been noticing the complications of the theories which ignore God, and it is by no means certain that they will work at all. On the other hand, the theory (it is more than a theory, but never mind) that God created things is perfectly simple, and anyone who has any adequate notion of God could not doubt that it will work. What reason, then, is there to halt between two opinions? (I Kings 18:21)

And Then the Moon "Rang"

Recent visits to the moon have resulted in a variety of surprising information. One of the most surprising surprises came after the visits were over. When part of Apollo 12 crashed into the surface, the moon "rang," one might say; the shock reverberated for nearly an hour.¹³ On earth, such a shock would die out in, at most, a few minutes.

Explanations of this behaviour still seem to

be in the realm of speculation, and not very convincing speculation at that. It does seem to show (which was already becoming apparent from other evidence), that the moon is very unlike the earth. Surely this will make difficulties for any theories which have the moon formed alongside the earth, from the same material; or which have it break off the earth at some time in the past.

Presumably it can still be maintained that the earth "captured the moon (although there may still be some question as to whether such a thing is mechanically possible, or likely), but it is to be noticed that, if so, a theory which set out to be uniformitarian has been forced to introduce a catastrophe.

Of course, when we believe that the moon was created and with a purpose quite different from that of the earth, we are not at all surprised to find that it is different from the earth in many respects.

Differences of Atmospheres

Some results of the Russian unmanned rockets to Venus have been reported recently.¹⁴ These gave little or no information about the surface, but quite a lot about the atmosphere. It appears that the atmosphere is 93% to 97% carbon dioxide, 2% to 5% nitrogen and inert gases, and no more than 0.4% oxygen.

Evidently few data about the lowest parts of the atmosphere were obtained, but it is estimated that the pressure and temperature at the surface may be as much as 140 atmospheres and 530°C. Some attempt was made to measure the illumination; and, while it does not seem easy to interpret the data quoted in terms that are to our point, it appears that not very much light penetrates, most light being reflected or absorbed by the dense atmosphere.

It would seem highly unlikely that there is anything living on Venus. Moreover, it seems strange that Venus and earth, which are so much alike in size, in density, and in position, should differ so much in atmosphere. In fact, if they came about by chance, and especially by the same chance, such a state of affairs would be unbelievable. But if, of course, they were created, each with its own purpose, there would be nothing strange at all in such differences.

Also, while Venus, being closer to the sun, would be expected to be warmer than the earth; the difference would appear to be more than that accounted for by distance alone. (It would appear that the difference in temperature of earth and Mars, on the other hand, are about what would be expected from their different distances.) The very high temperature on Venus is likely to be ascribed, in part at least,

to the greenhouse effect. This shows how easily even a rather thin canopy around the earth, before the flood, could have caused the mild climate for which fossils give much evidence.

Data from Saturn: Fit or Misfit?

It is reported that Dr. G. P. Kuiper, of the University of Arizona, has found strong evidence to show that the rings of Saturn are formed mostly of solid ammonia, not, as has been supposed of ordinary ice.¹⁵ This conclusion comes from the analysis of the spectrum of infra-red light reflected from the rings.

This finding presents a real difficulty for anyone who wants to believe that the rings are ages old. For while the rings are no doubt cold, yet even at very low temperatures the vapour pressure of ammonia is appreciable. (In ice-making plants, it boils at temperatures below that of ice.) So the solid ammonia must be subliming all the time.

Surely the solid ammonia would all have disappeared in a few million years. But it could have lasted for a few thousand years, just as a moth ball could last for two or three winters, but would have sublimed long before two or three centuries had elapsed.

The rings of Saturn are troublesome for any theory that the solar system is very old in several ways. Just on grounds of mechanical stability (or instability!), it seems highly unlikely that they could have lasted for many millions, or even billions, of years.

Saturn's rings seem to have been "Exhibit A" in the old nebular theory, since they were supposed to show an early stage in the evolution of the system. Is it not a strange turn of events that they are now proving to be a great source of embarrassment for the evolutionary theorists?

More on Effect of Magnetic Field

Creationists have been suggesting for some time that cosmic rays, reaching the earth in considerable intensity, at the time of the flood and after, may have had a great effect on many living things. Now such a possibility, stated in somewhat different terms, has been suggested in a journal that is by no means creationistic in its viewpoint.¹⁶

It is suggested, in fact, that a decrease in the earth's magnetic field (which is known to vary with time), might have let in enough of the cosmic rays to have exterminated some of the kinds of animal which in fact have become extinct. Here is another example of the way in which the supposedly uniformitarian theorists, being unable to overcome various problems, are forced to appeal to catastrophes.

It is interesting that, of all the planets, satellites, and asteroids, which are anything like the

earth in composition and nature, the earth, as far as we know, is the only one that has an appreciable magnetic field. Is it possible that this is not just a casual feature of the earth, but rather is a vital part of our protection against the radiation, etc., which would otherwise reach us from outside?

The air, we know, is very important in protecting us against too much radiation of such kinds as ultra-violet. Is the magnetic field our armour (or part of it, anyway), against the enormously energetic radiation which makes up cosmic rays?

The notion of containing energetic particles in a magnetic field is being tried in experiments on nuclear fusion, where the reaction must be contained somehow, but any material container would be vaporized immediately. But it would appear that a magnetic field has excluded particles from the earth for thousands of years. Once again we are learning to apply a principle which the Architect and Engineer of the universe used in the beginning.

Design and Solar System Regularities

It would be generally agreed that regularity in anything is evidence of intelligent design; that the more regularity there is in anything the less likely it would be to have come about by accident or chance. Some recent discussion of regularities in the solar system may be of interest." These regularities are "resonances," relations among the periods, etc., of the various bodies in the system.

The discussion is quite mathematical, and is not always easy to follow, or to see just what criteria of regularity are being used. However, the conclusion is plain enough. An estimate of the probability that as much regularity as there is in the solar system could come about by chance (possibly it is a contradiction to talk of regularity coming about by chance at all, but let that pass) results in one chance in 10^{10} .

It is nothing new, of course, to notice regularities in the solar system. Bode's law, a relation of the distances of the various planets from the sun, has been known for a long time. Sometimes the law is dismissed as being of no significance, but a recent book¹⁸ urges that it means something, although we do not know just what to make of it.

It has been suggested also that there is a logarithmic relation among the distances of the planets, and that there are similar relationships for the satellites of the planets which have several.

Solid to Dust? Or Vice Versa?

Since the notion that the planets had condensed out of a nebula ran into difficulties, one

favorite attempt to avoid some of the difficulties has been to suppose that the planets were formed by the conglomeration of small pieces of solid material. In one way, this would seem, not to solve the difficulty, but merely to shift it.

Indeed, the solid lumps cause another difficulty, which, in a plain way, might be stated thus: Suppose that one were to take a shallow bowl, partly full of marbles, and try to fill it by throwing in more marbles from a distance. He would be very likely to find that every marble that went in knocked two out, so that he would lose, not gain.

It has been pointed out that, in fact, much the same thing is met when attempting to conglomerate bits of debris into a planet.¹⁹ More is lost than is gained, and "... at present, asteroids and lunar-sized objects are probably undergoing net erosion by impact." The impacts, of course, are those of little meteorites, which presumably are something like the debris that is supposed to have formed the planets.

The earth, presumably, gains material from meteorites. Of course, the protection of an atmosphere helps; also the earth, being heavier, is better able to "hold onto" things. But surely, if the planets really were formed by conglomeration, there was a time when they were no bigger than asteroids, and without an atmosphere, what is more. It would appear that the theory of planet formation by conglomeration can be made to work only by saying "things were different then"—which, of course, could be used to justify anything.

Indeed, evolutionary theorists are up against the same difficulty in a thousand places. Having proclaimed that "the present is the key to the past," they must turn around and maintain that the past was different from the present.

It is also remarked, incidentally, that it is "... difficult to see how initially rocky small asteroids could ever acquire a sandy surface, since all of the ejecta from an impact is thrown off the asteroid." If this is true of the moon also, is it not strange that the moon still has a coating of sand or dust in many places? On the other hand, to suggest that, at its creation, a few thousand years ago, the moon was dustier than it is now, and that it has been losing material since, is quite reasonable.

More Discrepancies on Solar System

Those who maintain that the solar system evolved somehow or other have, in the past and now, come up with quite a number of theories as to how it might have happened. It would be fair to say, though, that no theory is without difficulties. (The belief that the solar system was created is not, on the part of us who believe, a theory.)

Since the sun and the rest of the solar system "go together," presumably there is something common about their origin. Either, then, the sun and the rest of the solar system originated together, or else the sun existed first, and the rest of the system was formed from it somehow.

Probably no one would believe that the planets etc., existed first, and somehow "acquired" a sun. To suppose, however, that the sun first existed alone, and then captured the planets, etc., one by one, is not quite so absurd; but the many regularities in the system make such an origin seem unlikely. On the other hand, there are also irregularities, and they are a source of objections to many theories about the origin.

Recently an irregularity has been pointed out. The densities and chemical compositions of the planets and satellites vary considerably, and there is "... no simple pattern in their densities as associated with their masses ... (nor) ... with the distances from the Sun ... there are wide differences in the chemical composition ... This would be astonishing were the bodies formed separately out of the same raw material. ..."²⁰

The suggestion is that once two planets of the terrestrial type existed, and these separated, maybe by rotational instability, into the present planets and satellites. The material, then, had already been sorted to some extent, and thus gave rise to bodies of different densities and compositions.

This proposal would seem to be open to objections; the mechanics of the splitting, e.g., to give the present arrangement of planets, etc., seems far-fetched. But this work does make explicit a weak point in many of the theories.

"Struggle for Molecular Existence?"

It is not very common to find an article, in journals which follow mostly evolutionary doctrines, in which the difficulties facing some part of evolutionary theory are discussed frankly. But one has appeared recently and may supply creationists with some ammunition. The author states the case thus:

Modern biology is faced with two ideas which seem to me to be quite incompatible ... One is the concept of evolution by natural selection of adaptive genes that are originally produced by random mutations. The other is the concept of the gene as part of a molecule of DNA, each gene being unique ... If life really depends on each gene being as unique as it appears to be then it is too unique to come into being by chance mutations. There will be nothing for natural selection to act on.²¹

It is remarked that, while a symposium of mathematicians and biologists discussed this

matter in 1966, it produced no solution. The author confesses his belief that, in fact, only a very few of those at the symposium really understood what the symposium was all about.

Some numerical estimates are interesting. It is concluded that, on the basis of some reasonable assumptions and if everything went by chance, that, in four billion years on 10^{20} planets, the chance would be only one in 10^{415} that a DNA molecule would be produced. And even if one should appear, it would not be "plain sailing" from then on; the same kind of problem would appear at the next stage.

Calculation by another writer is quoted, in which it is estimated that the chance of life appearing "by accident," under certain assumed conditions, is about one in 10^{255} . This still amounts to saying: "No chance at all!"

Special creation, or "directed evolution" would, it is admitted, solve the problem; but these concepts are dismissed as "of little scientific value, in the sense of suggesting experiments." (I had always thought that the aim of science was to get at the truth, by experiments if necessary.)

The question is raised whether there might be "some inherent interaction between atoms and molecules which might raise the percentage of useful mutations . . . Could there be a feedback mechanism. . . ?" It begins to seem that the only alternative to special creation is the "life force" in some form or other, which is really a choice of pantheism instead of monotheism.

It is interesting to notice a remark about the "struggle for molecular existence," during discussion of the hypothetical early stages. Surely this is nothing more than a metaphor.

A footnote mentions a paper which, while apparently highly technical, seems to have a bearing on the question, and, if anything, to make the difficulties discussed in the paper even greater.²²

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THE MYSTERY OF BURIED REDWOOD

V. L. WESTBERG*

This paper is a report of evidence concerning redwood trees that are deeply buried in California strata. Such trees present a problem to uniformitarian geologists, but they fit clearly with explanations presented in terms of the Noachian flood.

A Napa, California well driller, Harold McLean, told me personally that he had drilled into a large redwood tree buried under 80 feet of sand and clay. Location of this tree in low rolling hills near sea level provided no clue to its mysterious burial. Since discovery of that redwood tree, I have collected many accounts of similar finds in Sonoma County including a sample of wood (Figure 1) and the driller's log on the particular find.

*Mr. V. L. Westberg is president of the Westberg Manufacturing Company, Sonoma, California 95476. He holds the B.S.E.E. degree.

Specific Documentation

In further correspondence with various well drillers and drilling firms, it became clear to me that there are numerous instances in which redwood logs are found deep in sand and clay. Some trees are found directly below huge thousand year old stumps in good condition as these trees are rot resistant. Some of these letters are included here as substantiative evidence.

To: Mr. V. L. Westberg

Date: 7-18-67

I have drilled into redwood trees several times—Sebastopol area from 20' to 85' Cotati

80' to 100'. The redwood trees were found in clay deposits.

Signed,
Frank King,
Tri-K-Drilling Co.

* * * * *

To: Mr. V. L. Westberg

Date: 7-12-67

We drilled through a redwood log 4 ft. thick, 40 ft. below the surface along Austin creek near the town of Cazadero. Besides the drill was a redwood stump 7 ft. across that was cut in 1922. This tree had grown to that size after the one we drilled was covered up making the buried log pretty old. We obtained samples of the buried tree and the wood was in perfect condition. This was about 10 years ago and I don't know what happened to the samples.

Signed,

Yours truly, Bob Cowart

* * * * *

State of California—Transportation Agency
Department of Public Works
DIVISION OF HIGHWAYS
District I. P. O. Box 3700 Eureka, Calif. 95501
Date: September 22, 1967

To: Westberg Mfg. Co.
3400 Westach Way
Sonoma, California 95476

Gentlemen:

Regarding your inquiry of September 14, 1967, a buried redwood tree was encountered in excavation about 30 feet below a large (7') redwood stump during construction of the freeway on the hillside above Scotia, California, in 1952, according to verbal reports from people who worked on the project.

The Pacific Lumber Company of Scotia, California, took this sound log and cut it up into small specimens on which they imprinted the history of the long-buried redwood log.

The only specimen in this office belonged to an employee who is now retired and the specimen is no longer here.

However, the log was a sizeable one, we are told, and perhaps The Pacific Lumber Company may have some specimens still available. Also, they can provide all the information you desire as to specific location, depth, age, etc.

Very truly yours,

Sam Helwer

District Engineer

by W. Z. Hegy

Assistant District Engineer

In addition to these letters, I have on file a water well driller's report from the Weeks Drilling and Pump Company, Sebastopol, California, dated 2/10/64, which indicates the site at



Figure 1. Sample of darkened redwood found 21 feet below soil surface, Sebastopol, California by Weeks-Howe Drilling Co. This wood is not petrified but lightweight with dark color. Size: 5" x 6".

which a black redwood tree was hit at a level of 21 feet in a drilling operation. A photograph of a portion of this buried redwood tree is shown in Figure 1. Although this particular sample was discovered at a depth of only 21 feet, it is an example of the finds located as deep as 100 feet in the above reports.

Interpretive Framework Offered

I have published a small tract¹ concerning these redwood finds and their interpretation in the light of Bible history. Until I read a fascinating booklet (*The Marvel of Earth's Canopies* by Theodore Schwarze²), I saw no adequate explanation for these buried trees. The author's treatment in this booklet of related events in the first nine chapters of Genesis leave little doubt in my mind that such trees were buried in the cataclysmic flood of Noah's time.

Professor Schwarze's book related how a huge canopy of ice crystals covered the earth hundreds of miles above it. This kept the entire earth in a tropical climate that existed until the time of Noah. This moderate pre-flood climate accounts for location of extensive coal fields at the poles, and bodies of mastodons found frozen in these areas. Genesis 1:7 fits with this canopy view as it mentions, "The waters under the firmament."

When the Lord willed to remove sinful men from the earth, evidently He melted this thick canopy, causing it to condense and descend, producing rain for 40 days and 40 nights upon the earth. Noah, his family, and pairs of animals were saved from this great flood in the Ark which the Lord had him build for this express purpose when he was 500 years old.

As the heat of earth was quickly lost by radiation, this canopy evidently came down swiftly at the poles as ice and snow which trapped large mastodons even in a standing position at times. Professor Schwarze points out that the canopy view discredits not only the evolution theory but also the theory of the prolonged "ice age" and "Carboniferous age" for coal formation.

An interesting ecological change is seen regarding these buried trees. Some are buried in areas of the Sacramento and San Jauquin Valleys where redwoods do not grow now. This would fit with a supposed major climatic change associated with the flood.

And redwoods described in this paper were buried in deposits that appear to be Mesozoic with materials of Tertiary and Pleistocene also present. One could not say with absolute scientific certainty that these trees were buried in the flood event because Pleistocene strata may in some cases represent post-flood action. But,

whether they were buried at the onset of the flood or as a result of its dynamic aftermath, these trees are undeniable evidence for great catastrophe in earth history.

Conclusions

Genesis 7:24 indicates, "... the waters prevailed upon the earth 150 days." I propose that avalanches in the flood tore giant trees down and, in Napa, California, covered them with 80 feet or more of sediment—a condition which is not easily explained any other way.

More work is needed on the extent of such buried tree remains. Further evidence of this nature will be helpful in understanding the dynamics of water action during the global flood

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IMPORTANT REFERENCE

Guide to Fossil Man (A handbook of Human Palaeontology). Michael Day. Cleveland and New York: Meridian Books (M 253), The World Publishing Company, 1965. (\$4.95)

A basic reference work that provides comprehensive information in three parts. Detailed treatment of each location of fossil hominids includes: names given to the remains, geology, associated fauna and artifacts, dating, morphology, and principal dimensions of the hominid remains. These facts are followed by sections on affinities with other hominid remains, institutions where the originals may be seen, and availability of plaster casts. In addition to textual coverage of the great finds throughout the world, exhaustive tables, maps, diagrams, photographs

(of actual remains without any "reconstructions"), a glossary, a comprehensive index, and complete bibliographies are provided. This book makes excellent supplementary reading to the article, "Fossil Man: Ancestor or Descendant of Adam?" by R. Daniel Shaw in the *Creation Research Society Quarterly* of March, 1970 (Volume 6, No. 4, pp. 172-181).

Michael Day is Senior Lecturer in Anatomy at the Middlesex Hospital Medical School of the University of London and has been engaged for years in research and teaching in the field of paleontology. Professor J. S. Weiner, Past President of the Royal Anthropological Institute, wrote a high commendation of this reference book in his Foreword.

ORIGIN OF LIFE SPECULATIONS

(Continued from page 45)

4. The origin of stable, complex, metabolically active systems which were composed of "biologically active" proteins (such as enzymes), nucleic acids, and other metabolically active compounds, such as coenzymes and high energy phosphate compounds.

5. The origin of the first completely independent, stable, self-replicating unit-the first living cell.

Such solutions pose tremendous challenges to evolutionists, even to those who tend to take conjecture and extrapolation too seriously, and who have a tendency to confuse what they are saying with reality. I am personally under the conviction that man will never be able to comprehend how life may have originated. Its creation required a Mind infinitely greater than that of any man.

Through faith we understand that the worlds were framed by the Word of God, so that things which are seen were not made of things which do appear. (Hebrews 11:3)

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TIME, LIFE AND HISTORY

(Continued from page 71)

table matter back into the oceans and thereby increase directly the amount of carbon in the carbon cycle. This value of 2.50 cm/sq. cm., divided into a pre-flood C-14 production rate of about 161 atoms/min-cm. (i.e. essentially the same as today) would give the SPR value of 64.4.

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