

Creation Research Society Quarterly

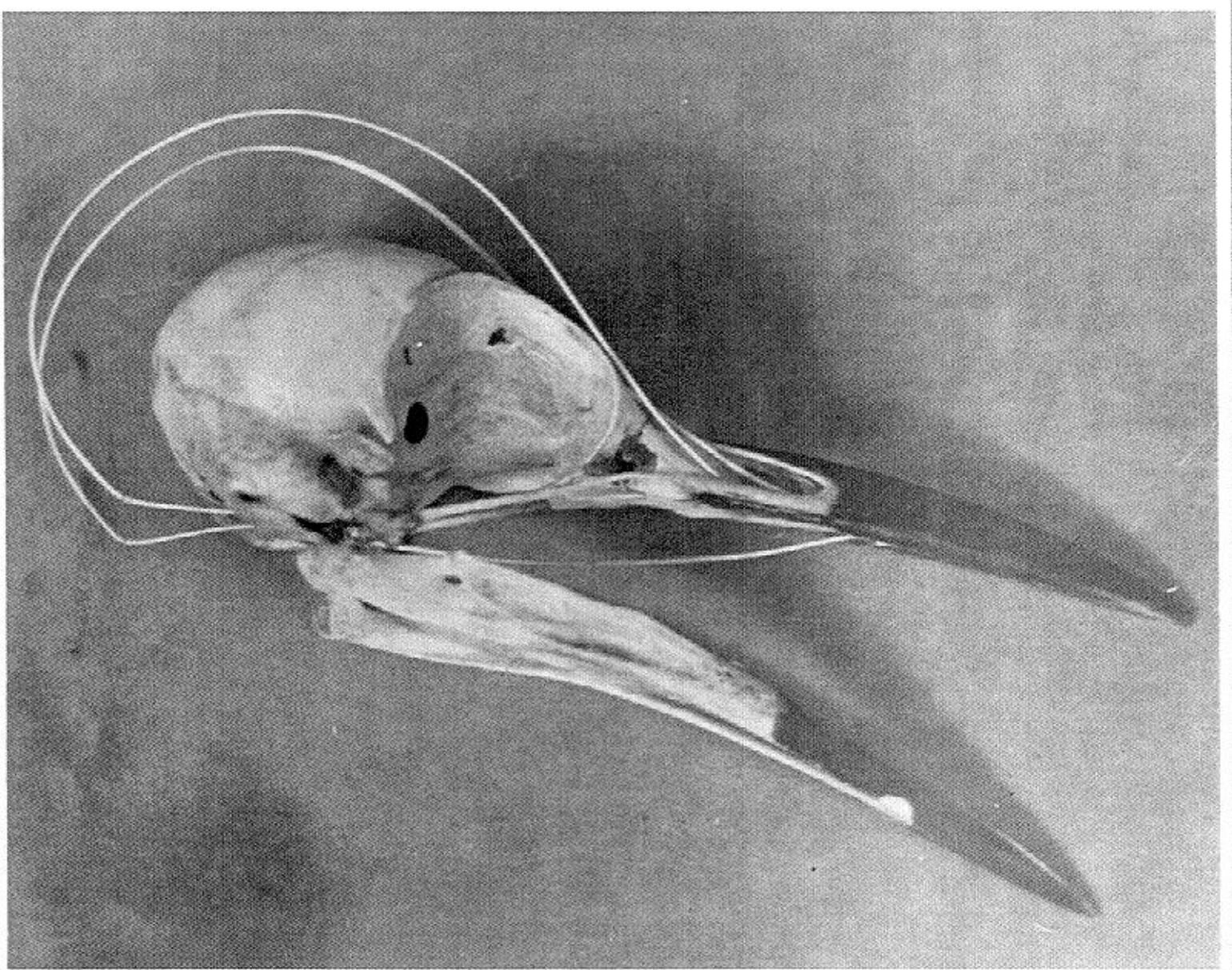
Haec credimus:

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

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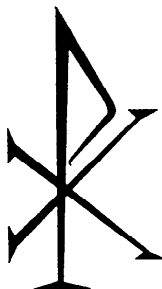
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ABOUT THE COVER

The Picture on the front cover, which was contributed by Luther D. Sunderland, is of the skull of a woodpecker. The extraordinary feature is the tongue. Since the woodpecker's tongue is composed of an elastic tissue, and stiffened at the base by five tiny bones, the tongue has survived along with the skull. As can be seen, the tongue comes out of the right nostril, splits into two segments, wraps around the skull beneath the skin, passing on either side of the

neck bones; and then the two parts join together and come up through the lower jaw.

This arrangement is clearly an ingenious way of making room for the long tongue which the woodpecker needs for its way of life. But surely it is quite impossible that such a thing could have evolved by a series of small mutations.

See the facing page for more about this extraordinary feature.

MIRACULOUS DESIGN FEATURES IN WOODPECKERS†

LUTHER D. SUNDERLAND*

The woodpecker has a number of specially designed features which distinguish it from other birds, and permits it efficiently to function as a living "jackhammer".

One of the most amazing features is a tongue that extends three to five times the normal length to extract worms and insects from hollow trees. One might think that the woodpecker would need to have a tongue rooted in the tail to perform this neat trick; but in reality, the tongue originates in the right nostril. It exits the right nostril, splits into two segments, wraps around the skull beneath the skin passing on either side of the neck bones, joins together and comes up through the lower mandible (jaw). It is composed of an elastic tissue and the root portion is stiffened by five tiny bones called the hyoid apparatus.

These bones can be seen clearly in the cover illustration which is an untouched picture of a flicker woodpecker's skull found in this exact condition in the woods by Mrs. Clair Gotshall in Susquehanna County, Pennsylvania. Insects had apparently picked the bones clean of all flesh.

As can be seen, two of the hyoid bones exit the right nostril and are connected to the next two bones by miniature ball joints. A third ball joint appears at the fork as it passes through the jaw where the fifth bone is joined which stiffens the outer portion of the tongue.

Charles Darwin's Omission

Charles Darwin wrote that the thought of how anything as complex as the eyeball could have evolved turned him cold. Well, the woodpecker's tongue must have literally frozen him up completely; for he wrote an entire page in *The Origin of Species* about the marvelous adaptations of the 179 species of woodpeckers, but he didn't even discuss the most marvelous feature of all, the origin of the tongue in the right nostril. Neither the *Encyclopedia Britannica* nor *Americana* contains any mention of it either, although the 1972 edition of the *World Book Encyclopedia* contains a sketch of the complete tongue with hyoid.

*Luther D. Sunderland received a B. S. degree in Industrial Engineering from Penn State University in 1955. Since then he has designed automatic flight control systems at General Electric in Binghamton, New York, for a number of supersonic aircraft. He is currently developing a solid-state rate gyro which uses a vibrating element similar to the sensor used by the house fly for stabilization in flight. Also he has built three light aircraft, and has designed a wing whereby an airplane can be converted for ground transport in just two minutes so the plane can be trailered for home storage like a boat. Mr. Sunderland is the founder and president of a local group of creationists, the Creation Science Society. His address is 5 Griffin Drive, Apalachin, New York 13732.

†An account similar to this by the same author appeared in the *Bible - Science Newsletter*, Vol. 13, No. 10, October, 1975, p. 4.

Other special features are: A tough beak that can drive through hard wood which would bend a nail; strong neck muscles that deliver jackhammer blows to the head and beak; a thick skull that withstands continuous shocks that would kill or give a bad headache to other birds; a glue "factory" in the tongue which makes the surface sticky; stiff tail feathers with sharp spines which brace the bird for hammering; and viselike toes with two in front and two in back, rather than three and one like other birds. All these features are integrated into a perfect living, flying jackhammer.

Admitted Insurmountable Problems

Think of the insurmountable problems this bird poses for evolutionists. They would need to start their evolutionary speculations with a normal bird like a robin. Think how many millions of robins would need to have bashed their brains out trying to play jackhammer before, not just one, but a pair of them accidentally and gradually mutated a tongue like that. Even if two were lucky enough to come up with the right tongue, it would have been of no adaptive advantage without the other features.

This woodpecker's skull has been more effective in convincing scientists of the inadequacies of the evolution "theory" than perhaps any book in the author's library. Other birds have hyoid bones, also, but it would seem obvious that some sort of miracle would be needed to get them rooted in the right nostril.

One prominent evolutionist on the editorial staff of a prestigious scientific magazine confided to the author after examining the skull, "There are certain anatomical features which just cannot be explained by gradual mutations over millions of years. Just between you and me, I have to get God into the act too sometimes."

Another scientist observed, while examining the skull under a microscope, "It is very easy to tell the difference between man-made and God-made objects. The more you magnify man-made objects, the cruder they look but the more you magnify God-made objects the more precise and intricate they appear."

A Note

For more about birds' tongues, see Wallace, George J., and Maken, Harold D. 1975. *An introduction to ornithology*. Third Edition. Macmillan Publishing Co., Inc., New York, pp. 119 and 120.

Editor's Note: I understand that Mr. Sunderland published a letter to the editor in the local newspaper in which he offered a reward of \$25.00 to anyone who could give a reasonable explanation of how the woodpecker's tongue could have evolved. Needless to say, Mr. Sunderland still has his \$25.00.

SPECIAL REPRINT AVAILABLE

The primary purpose of the Creation Research Society is to carry out, or to encourage, Creationist research in the natural sciences, and to publish the results of such research. In an article in the June, 1975 issue of the *Creation Research Society Quarterly*, Dr. Duane T. Gish published a summary report of Creationist research in the last decade.

His report was organized under these headings: Geology, General Geological Reports, Genetics, Natural Selection, General Biology, Taxonomy, Thermodynamics, and A Research Challenge.

So that members of the Creation Research Society and other interested persons might distribute this summary of a decade of Creationist research a special reprint of the Gish article has been made available. The 16-page reprint is priced at 75 cents per copy, with price reduced to 50 cents each for orders of 100 copies. Orders for the reprint may be placed through the College Bookstore of Concordia College, Geddes Road, Ann Arbor, MI 48104. Postage will be paid by the bookstore.

POST-FIRE REGROWTH OF *ADENOSTOMA FASCICULATUM* H. & A. AND *CEANOTHUS CRASSIFOLIUS* TORR. IN RELATION TO ECOLOGY AND ORIGINS

GEORGE F. HOWE*

*Regrowth of two important chaparral shrubs (**Adenostoma fasciculatum** H. & A.—chamise, and **Ceanothus crassifolius**—buck brush) has been studied after five different fires in the vicinity of Newhall, California. It is clear that chamise seedlings are regularly important in regeneration of chamise populations after fire, even though preexisting chamise plants can resprout from their crowns. It is found, on the other hand, that populations of buck brush frequently do not regenerate after fire despite the great buck brush potential for seedling growth. This problem is briefly examined although no immediate explanation is apparent.*

The Problem Stated

Certain evolutionists maintain that chaparral genera which resprout from the old plants, as well as producing seedlings (*Adenostoma*, for example), routinely have fewer taxa because they have reproduced vegetatively by sprouting, thus resisting the microevolutionary changes which accompany the sexual life cycle involving new seedling generations. They also claim that speciation and specialization have been hastened in those shrub genera in which certain species are unable to sprout after fire (e.g. *Arctostaphylos* and *Ceanothus*).

However, it is shown here that *Adenostoma* (a genus which experiences widespread and vigorous seedling regrowth and survival) possesses only three taxa. Thus it is concluded that some genera have numerous taxa (*Ceanothus*) and others few (*Adenostoma*) depending upon factors other than seedling versus crown sprout reproduction, such as:

1. the fact that "splitters" in taxonomy have dignified certain types to taxon status with binomial names when such groups are really only parts of one major cenospecies.
2. some genera may have had gene systems which predispose them to rapid "speciation".
3. the Creator may have distributed more taxa in certain genera for very practical reasons which scientists must yet discover. Several avenues of further research are suggested.

Introduction

Two shrubs distributed widely throughout the chaparral of Southern California are the chamise (*Adenostoma fasciculatum* H. & A., Figure 1) and the buck brush (*Ceanothus crassifolius* Torr., Figure 2). Chamise has two different modes of regrowth after fire—by old plants sprouting from swollen, charred crowns, and by seeds which germinate forming a carpet of new plants. Burned buck brush plants, on the other hand, are unable to regenerate by crown sprouting and are thus limited to seedling reproduction. In fact, certain whole sections of the genus *Ceanothus* are unable to crown sprout while other sections of the same genus can.¹

In their studies of regrowth after fire in the chaparral of the San Jacinto Mountain region, Richard Vogl and Paul Schorr found that seedling mortality in chamise was high and they concluded that chamise seedlings seldom contribute to mature chaparral cover.²

Philip Wells noted that chaparral genera which regenerate by both crown sprouting and seedlings (e.g. *Adenostoma*) contain relatively few taxa.³ Conversely, Wells reported that genera in which certain species are unable to reproduce by crown sprouting (such as *Ceanothus* and *Arctostaphylos*) are found in many taxa. Wells concluded that the tempo of

evolution in *Arctostaphylos* and *Ceanothus* was quickened by: "... abandonment of the conservative, crown-sprouting mode of reproduction in favor of a non-sprouting, obligately-seedling response to recurrent fire that results in a greater frequency and intensity of selection."⁴



Figure 1. The chamise *Adenostoma fasciculatum* H. & A. so common to the chaparral of Southern California.

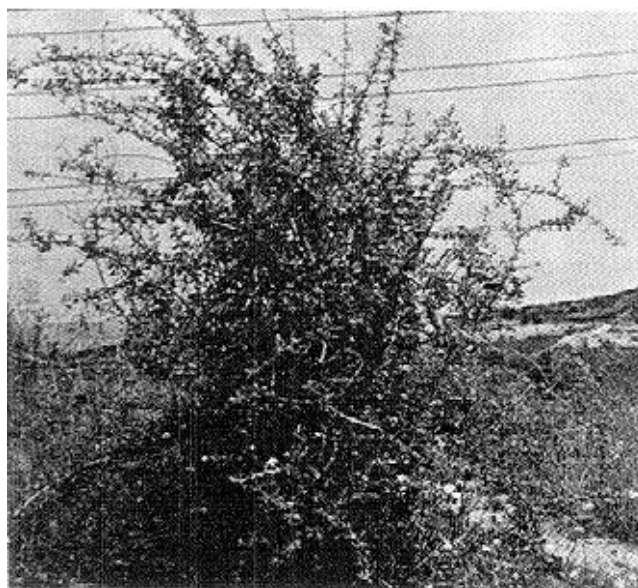


Figure 2. The buck brush *Ceanothus crassifolius* Torr., widely distributed throughout the chaparral of Southern California.

*George F. Howe, Ph.D., is professor and chairman, division of natural science and mathematics, Los Angeles Baptist College, Newhall, California 91321.



Figure 3. Dead charred stumps of buck brush showing alternating pattern of branch arrangement.

In the present paper, field observations of seedling behavior are reported from five different fire sites in the Newhall, California region. These observations are discussed in relation to Vogl and Schorr's belief that chamise seedlings seldom contribute to the mature chaparral cover. The evolutionary concepts of Wells are likewise evaluated in the light of field data.

Observations

Regrowing populations of chaparral shrubs have been observed at the site of five different fires over a period of several years following each burn. These fires occurred in communities generally located on the north and/or south facing slopes of ridges that run east and west. Extensive reports on other facets of regrowth will be presented in subsequent papers but attention is drawn presently to chamise and buck brush.

It is possible to estimate the original pre-fire composition of the chaparral in most of these areas by studying adjacent unburned portions of each ridge. In the burn, stumps of buck brush have an alternating pattern of branch arrangement and are unmistakable even in the dead, charred condition (Figure 3).

Seedlings of chamise can be distinguished easily from old crown-sprouted specimens. A seedling is narrower and has no charred stem or burl at ground level (Figure 4) while a crown-sprouted plant almost always manifests charred stumps amid the new branch sprouts—evidence of its existence before the previous fire (Figure 5). Crown-sprouted plants are invariably larger than seedlings during the first decade of development. Crown sprouts form on burned plants in just a matter of weeks after the fire and shoots over 12 inches tall exist before the first rainy season begins. Likewise crown-sprouted plants have a fully developed root system right after the fire whereas seedlings generally do not begin growing until the rains arrive—anywhere from two to four months or more after the fire.

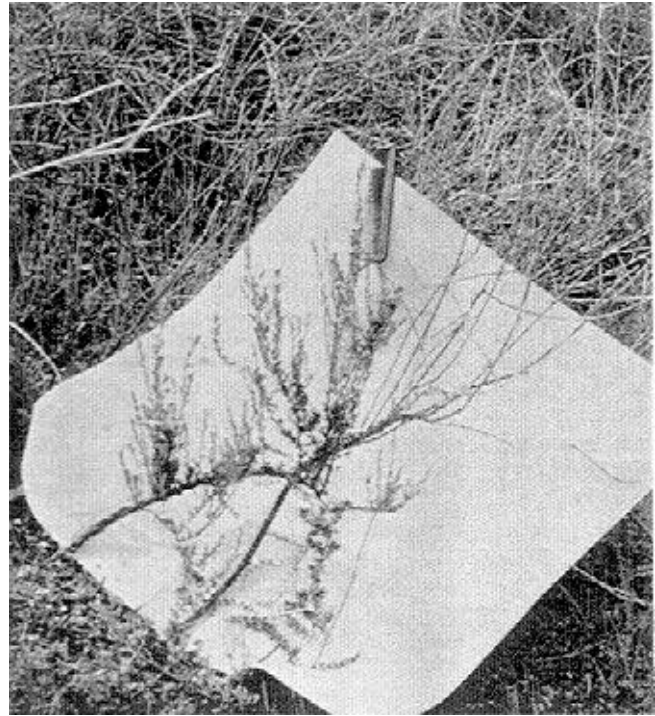


Figure 4. Chamise seedlings. Note absence of charred stem or burl at ground level. Seedlings are near pen and camera.

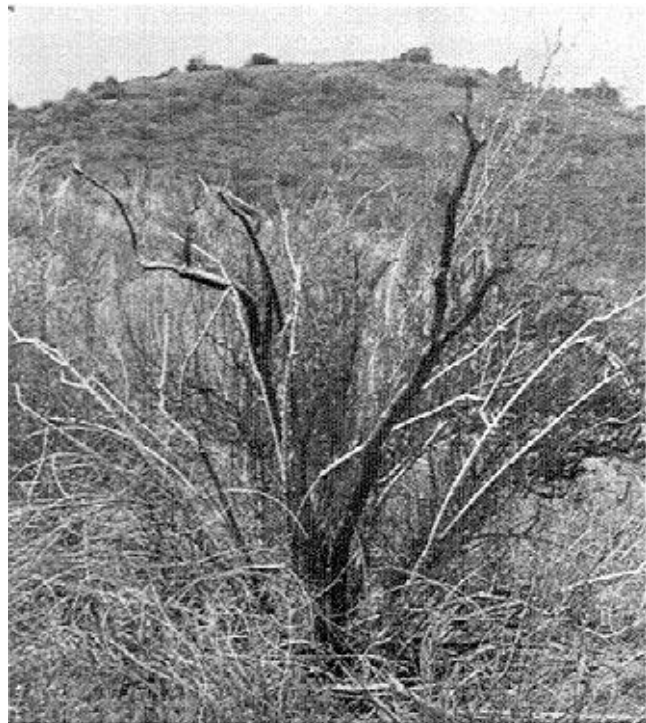


Figure 5. A crown-sprouted chamise as evidenced by presence of charred stumps amid new branch sprouts.

Table 1. Observations of chamise and buck brush regrowth at the sites of five different fires, Newhall, California.

Fire name and date	Original condition	Location and topography	Restudy date(s)	Condition chamise population	Condition buck brush population	Rainfall, inches during first season
Placerita Canyon Road, August 1962	Chamise and buck brush, clumps.	South slopes of east-west running ridge south of and parallel to road.	3-21-73	Seedlings few. Crown-sprouting of scattered individuals.	Scattered groves in grass community. Major groves from before fire destroyed.	—————
Oak Orchard Lane, 6-2-69	Mixed stand of chamise & buck brush.	North-facing slope of east-west running ridge north of and parallel to road.	April '69 5-2-70 4-11-75	Thick regrowth seedlings throughout, Fig. 4. Crown sprouts few and only at lower portion slope, Fig. 5.	Largely destroyed. Burned stumps remain, Fig. 3.	27.70 (very high)
Peachland Avenue, 10-4-70	Mixed stand buck brush & chamise, chamise clumped.	North and south facing slopes of west running ridge south of terminus, Peachland, Avenue	3-21-73	Sparse regrowth of chamise seedlings. Crown sprouting common.	Only 7 seedlings on south facing slope and a few on north facing slope where thick stand prevailed before fire.	15.09 (average)
Castaic or Lake Hughes Road, Autumn 1970	(?) Possibly near pure stand chamise.	Gentle, south facing slope about 300 yards east of Lake Hughes Road, above Castaic Lake.	April '74 March '75	Mostly seedlings with scattered crown sprouted plants, Table 2.	—————	15.09 (average)
Wildwood Canyon Road, 8-28-73	Mixed stand chamise and buck brush.	North and south and west facing slopes of small east-west ridges leading into main north-south ridge.	8-6-74 3-24-75 4-10-75	Vigorous seedling growth and substantial crown sprouting. See Figs. 6, 7, and 8.	Dense germination and survival of seedlings evident on all slopes.	13.24 (low average)

Dates of the various fires are reported either from personal observation or from records kept at the Newhall Station, Los Angeles County Fire Department. The growing season corresponds to the rainy season which may extend from November to May. Thus seedlings observed in April of 1975 would have experienced two growing seasons following a fire in autumn of 1973, for example. The data for the various fires are summarized in Table 1 and then various additional observations on certain fires are indicated thereafter.

Wildwood Canyon Road Fire

On a west-facing slope in this study seedling growth is being recorded at five charred telephone poles which serve as reference points for circular quadrats spaced at intervals along the slope. Each quadrat consists of a circle three feet in radius (approximately 28 sq. ft.) around each pole. The perimeter of the circle is judged in each observation by use of a yard stick. A complete account of these quadrat studies will be published after several more years of observation. At this time (spring, 1975) two growing seasons have occurred in these quadrats following the 1973 fire.

As seen in Table 2, of the three quadrats which originally manifested chamise seedlings surviving in 1974, two still had chamise seedlings present during the second growing season, 1975. From analysis of these quadrats and marked areas on ridges nearby, there is reason to believe that the seedlings will persist and play a significant role in the regeneration of chamise cover at the Wildwood burn (Figures 6-8).

Table 2. Survival of seedlings at pole quadrats in the Wildwood Canyon Road burn, Newhall, California.

Pole Quadrat and Date	<i>Adenostoma fasciculatum</i> (chamise)	<i>Ceanothus crassifolius</i> (buckbrush)
1; 8-6-74	0	0
1; 3-24-75	0	0
2; 8-6-74	3	5
2; 3-24-75	0	4
3; 8-6-74	10	6
3; 1-17-75	3	4
4; 8-6-74	0	100
4; 3-24-75	0	30
5; 8-6-74	13	25
5; 3-24-75	13	13

Although only an average amount of rain fell in the first season following the Wildwood Canyon Road fire, there has been profuse germination and survival of buck brush seedlings (see Figure 7). This was not true of the other fires in this study (see Table 1). In the Peachland Avenue burn, for example, extensive buck brush cover was destroyed by the fire and only a few scattered seedlings survived.

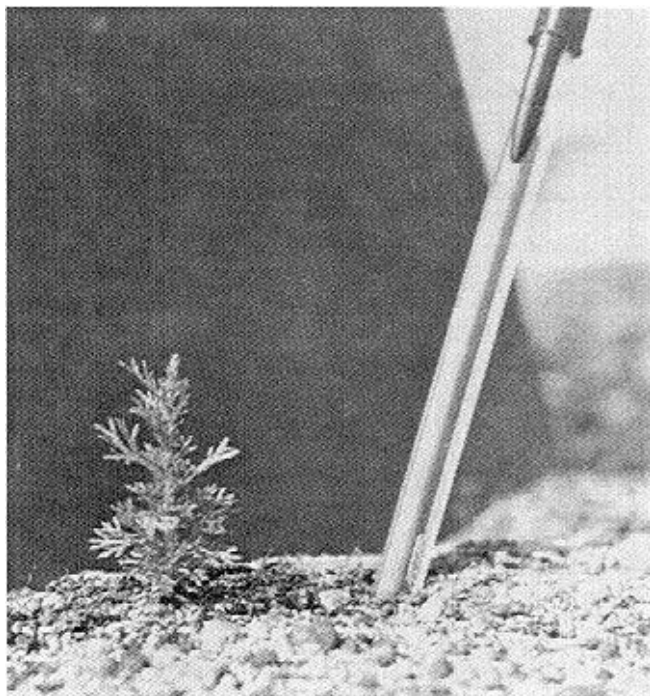


Figure 6. Typical chamise seedling surviving in Wildwood Canyon in 1974 after 1973 fire.



Figure 7. Well established buck bush seedling in Wildwood Canyon. Seedling is located to right of pen in center.



Figure 8. Portion of a quadrat at Wildwood Canyon showing multiple chamise seedlings (to right of pencil and camera) surviving in 1974 after 1973 fire.

Castaic — Lake Hughes Road Fire

In April of 1974, approximately 44 months after this fire occurred, a chamise chaparral south-facing slope territory east of Lake Hughes Road was examined to determine what proportion of chamise plants were crown sprouted individuals as opposed to seedlings. Four 12 by 12 foot square quadrats were randomly marked off and the number of seedlings versus crown sprouted chamise plants was determined. (see Table 3).

On this slope it is clear that seedling growth was more important in regrowth of chamise cover than crown sprouting by old plants. A sequel to this research will be completed since the same region burned again in the autumn of 1974.

Placerita Canyon Road Burn

In late August of 1962 there was a large chaparral fire on the south-facing sloped of a ridge south of Placerita Canyon Road. Study of this area was not begun until 1968. Whole groves of buck brush were eradicated by that fire and were not replaced by subsequent seedling growth.

Discussion

Chamise Seedling Contribution: Substantial growth of chamise seedlings along with crown sprouts was observed after several different fires in the vicinity of Newhall - Oak Orchard Lane, Castaic, and Wildwood Canyon Road at intervals of six and one half, four, and two years after burning, respectively. In each case the seedlings were making an important contribution to the new chamise population. Seedling survival of chamise has been a vigorous adjunct to crown sprouting in the Wildwood Canyon Road burn. Surviving chamise seedlings far outnumber crown sprouted specimens on the north facing slope of the Oak Orchard Lane fire and likewise on the south facing slope of the Castaic burn. It may be concluded that seedlings are definitely involved in the perpetuation of chamise populations after fires in the Newhall area. These results certainly conflict with the hypothesis of Vogl and Schorr:

We strongly suspect the *Arctostaphylos* and *Adenostoma* seedlings seldom contribute to mature chaparral cover . . . We hypothesize that a suspected preferred attraction of animals to seedlings allows the resprouts to grow relatively undisturbed particularly with high herbivore densities.⁵

Additional research is necessary to determine if chamise seedlings respond differently in the San Jacinto Mountains than in the Newhall area or if Vogl and Schorr's conclusions were premature.

Buck Brush Regrowth Patterns: Buck brush appears in many pure shrub stands and mixed with chamise or other chaparral species. In three of the four buck brush fires observed here (Oak Orchard Lane, Peachland Avenue, and Placerita Canyon Road) the buck brush plants did not return as densely after burning as before. A similar demise of *Ceanothus* was reported by Horton and Kraebel in their study of the Barranca Canyon burn, north of San Bernardino.⁶ They attributed the lack of *Ceanothus* regrowth to the fact the the Barranca fire occurred in the spring (March, 1942), possibly destroying the parent *Ceanothus* plants before that year's seed crop had ripened. But they found that fires in the fall were followed by a reverse situation: "However, it should be stressed that the summer and fall fires in the studied areas were followed by an increased number of *Ceanothus* shrubs."⁷

Table 3. Comparison of the number of seedlings and crown-sprouted plants on the Castaic (Lake Hughes Road) burn, Newhall, California area. Data were gathered in April, 1974. Since then the area has been burned again.

Quadrat Number	Chamise Seedlings	Chamise Crown-sprouted Plants
1	3	1
2	3	2
3	10	3
4	20	5
Totals	36	11

While a fire in the spring may be more destructive to *Ceanothus* populations, fires which occur in the autumn can likewise demolish cover of *Ceanothus crassifolius* (buck brush), as in the Peachland Avenue fire and Placerita Canyon Road fire. The June fire in this series (1968, Oak Orchard Lane) was also followed by a substantial decrease in the buck brush cover. In one August Wildwood Canyon Road fire, however, the buck brush seedlings have undergone dense growth and are apparently replacing the buck brush component originally present. Thus in distinction to Horton and Kraebel's results in the San Bernardino area, most of the summer and autumn fires studied in Newhall led to a demise of buck brush populations rather than a vigorous recovery.

It may be concluded that buck brush recovers vigorously after some autumn fires but is nearly demolished after others. There is no apparent correlation of survival and total rainfall during the first season after fire because there was poor regrowth of buck brush on the Oak Orchard Lane area following an unusually heavy rainy season and excellent regrowth along Wildwood Canyon Road after an average rainy season. Possibly the distribution of the rain—in November and December, for example, instead of largely in March and April—has some bearing on the survival or demise of buck brush seedlings. This problem should be studied further.

Speciation and Non-Sprouting: The theories of Philip Wells⁸ deserve extensive discussion in the light of the present research. Among the 20 genera listed on Wells' Table I, the two genera which have non-sprouting taxa (*Arctostaphylos* and *Ceanothus*) also possess a relatively large number of subsidiary taxa—75 and 58, respectively. Wells relates that among the other 18 genera, all of which regenerate by both sprouting and seedling activity after fire, the number of taxa per genus ranges downward from *Quercus* with 12 taxa to genera like *Pickeringia* (chaparral pea) and four others which have only one taxon per genus.

A large number of taxa in a genus apparently correlated with the propensity to reproduce by seedlings only, and a low number of taxa per genus correlates with ability to reproduce by both crown sprouting and seedling activity throughout the genus, as Wells has pointed out. Wells also believes that "loss" of the crown sprouting characteristic leads within a genus to greater rates of speciation and a greater degree of specialization in species formed because of an enhanced frequency and intensity of natural selection (consult quotation given above).

If it be granted for the sake of discussion that all taxa in each chaparral genus did arise from one common ancestral taxon, it would not be apparent as to which trait was

"ancestral"—the ability to reproduce by both seeds and sprouts or the ability to reproduce by seedlings only. Because crown sprouting is found in at least some taxa of all the 25 woody chaparral genera and because the ability to crown sprout is "... widespread ... among woody dicotyledons", Wells assumes that the ability to crown sprout in any genus was always "ancestral" or "primitive". Furthermore, he holds that "... loss of the sprouting faculty is indeed a specialized development in perennial dicotyledonous plants."¹⁰

But there are no absolute criteria by which to verify such an assumption and the opposite assumption might even be more logical for the evolutionist. Since the greater number of taxa in *Arctostaphylos* and *Ceanothus* are unable to sprout, perhaps the ancestral taxon in each of these genera lacked the ability to crown sprout and thus underwent considerable speciation. Accordingly, taxa with crown sprouting are outnumbered in both genera because the pace of speciation slowed or even stopped in those lines in which sprouting developed—a derived condition. This alternative should be discussed and researched.

Even if all the taxa in the genus *Ceanothus* descended from one common ancestral taxon, this would not constitute "evolution" on the grander scale but would simply be an example of speciation. Thus when Wells speaks of a "quickening of the tempo of evolution ..." he is, like so many other authors of papers published in the journal *Evolution*¹¹, dealing only with "microevolution" or "special evolution" rather than the "general" evolution or the "ameba-to-man" continuum which is so often implied by the use of the word "evolution".

Implicit in Wells' argument is the unstated assumption that within each genus studied all taxa arose from one common ancestral group. Wells presents no evidence to support this assumption and substantiation is generally unavailable because in most cases the origin of the taxa has not been observed through "speciation". Thus the speciation discussed is usually assumed and inferred speciation rather than demonstrated speciation, and alternative views should be considered.

Some of the 58 taxa designated within the genus *Ceanothus*, for example, may represent separate kinds created on day three of the creation week (Genesis 1:9-11). Other taxa in the genus may represent particular genotypes which the Creator established directly and rapidly after the flood with no recourse to speciation but in keeping with a model proposed by Walter Lammerts.¹²

Many of the so-called taxa in the genus *Ceanothus* may be insignificant groups which should not have been given taxonomic status as Van Rensselaer and McMinn have strongly asserted:

From observations made upon garden and field hybrids and other variations, the writer believes a comprehensive study of the genus *Ceanothus* based upon experimental methods would result in the acceptance of fewer species (ecospecies of the experimentalist) than we now represent by binomials in this volume and in other studies of the genus. It is the prediction of the writer that many of the forms now accepted as distinct species on morphological and geographical data would not prove to be true biological species (ecospecies of the experimentalist) if they were tested by putting them through the biological sterility sieve advocated by Clausen, Keck, and Hiesey (Table 2).¹³

Since *Ceanothus* is divided into only three sections and the species in each section undergo some hybridization with

other species in the same section, it might be reasonable to assert that there are really only three taxa or cenospecies in the whole genus *Ceanothus*.

Yet a more serious problem centers on Wells' belief that when a taxon can reproduce by both means, crown sprouting will consistently be more important than seedling survival in the establishment of a new population after fire:

The crown-sprouters, on the other hand, tend to reproduce successfully mainly by vegetative regeneration, as they usually grow in dense, laterally proliferating colonies. Although their dormant or suppressed seeds also germinate readily after fire, seed production is often lower among crown-sprouters (particularly so in *Arctostaphylos*). In any event, the root systems of established individuals have an overwhelming growth advantage over small seedlings, and rapidly recoup the initial monopoly of the shrubby canopy. Hence, not only the frequency, but also the intensity of natural selection is greater with the non-sprouting, obligately seeding strategy in fire-swept vegetation.¹⁴

Likewise, Vogl and Schorr asserted in the abstract of their report of post-fire studies in the San Jacinto Mountains that they suspected manzanita and chamise seedlings seldom contributed to mature chaparral cover.¹⁵ However, results in the present paper are noticeably different. In all areas where chamise was present, seedlings were contributing significantly to the restoration of chamise cover. Horton and Kraebel also reported that chamise seedlings were still surviving and had reached a height of 31.9 inches 25 years after a fire in the chaparral near San Bernardino.¹⁶ Wells readily admits that "... chamise possesses an equally superb capacity for reproduction by crown-sprouting or by seed (Sampson, 1944) ..."

If chamise can and does reproduce vigorously by seedlings, and if widespread seedling survival is a key factor enhancing speciation and production of many taxa, then *Adenostoma fasciculatum* populations would present extensive opportunity for natural selection to occur. Thus it is by no means clear why *Adenostoma* possesses only three subsidiary taxa. Evidently some plants like chamise have very few taxa despite the fact that they routinely and vigorously reproduce by seedlings after fire. Seedling activity after fire does not always yield speciation and specialization. Since *Adenostoma* has so many seedlings, there is evidently nothing inherent to speciation in the survival of seedlings after fire and students of origins must look elsewhere to explain how one genus (*Adenostoma*) has only three taxa and another genus (*Ceanothus*) has 58 taxa. In both cases seedlings contribute extensively to regrowth after fire.

Further Research and Reconsideration

Several areas which have appeared as settled in the literature deserve to be studied again. Additional study of the extent and character of hybridization between taxa in the genus *Ceanothus* ought to shed light on which taxa are valid groups and which are the products of overzealous taxonomy. Genetic studies in *Arctostaphylos* and *Ceanothus* might reveal some other causes such as peculiar gene systems which might predispose those populations toward reproductive isolation more readily than do the gene systems of other genera. Since it has been shown here that *Adenostoma* seedling development is vigorous, each of the other 18 genera which Wells assumed to reproduce largely or only by crown sprouting after fire should be reexamined to see if each genus has a great potential for seedling regrowth.

In the regrowth of vegetation after fire by crown sprouting mechanisms and by seedling survival the creationist sees the providence of God as recorded in the book of Job, chapter 38, verses 25-27:

Who hath cleft a channel for the waterflood,
Or a way for the lightning of the thunder;
To cause it to rain on the land where no man is;
On the wilderness, wherein there is no man;
To satisfy the waste and desolate ground,
And to cause the tender grass to spring forth?

Acknowledgements

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¹⁶Horton and Kraebel, *Op. Cit.*, p. 252.

A NOTE ON SPECIATION IN *CEANOTHUS* AND *ADENOSTOMA*

WALTER E. LAMMERTS*

Editor's Note: Since Dr. Lammerts has grown two large populations of Ceanothus seedlings from hybrid plants, it is pertinent for Dr. Lammerts to write on speciation in Ceanothus in relation to the previous article by Dr. George F. Howe.

The genus *Ceanothus*, as Dr. Howe suggests, certainly does form strikingly different variations where seedlings of hybrids are grown, variants which in other genera might easily pass for species. Thus "La Primavera" appeared in 1935 at the Santa Barbara botanical garden¹ among seedlings of some garden gathered seeds of *C. cyaneus*. Though similar to *C. cyaneus*, this variety bloomed one month earlier and had a sturdier root system.

Maunsell Van Rensselaer, then director of the Santa Barbara botanical gardens, kindly gave me open pollinated seed. I obtained mature shrubs from 807 seedlings. Among these 156 looked like *C. cyaneus*, 130 like *C. spinosus*, 178 like *C. griseus*, 225 like *C. arboreus*, 106 like *C. impressus*, and seven like *C. nomeanus*. Most important was the fact that five looked like *C. tomentosus olivaceus*, even though this species was not growing anywhere near the garden where "La Primavera" was located!

No doubt much of this variation was the result of crossing with the various species all of which, with the exception of *C. tomentosus olivaceus*, were growing in the vicinity. Such statistics do show the great potential for variation carried by *only one plant*, due to prior hybridization and compatibility of the gametes produced by it with those of other species.

Similarly in March of 1970 I planted seed of the variety "Theodore Payne", obtained 450 seedlings, and set them out in the spring of 1971. The astonishing variation among seedlings is seen in Figure 1, where the branch held at the right has small leaves in comparison with another seedling plant, at the left, with much larger leaves. In fact, no two plants were identical, as described in my article on the

origin of Gentian Plume.² This new variety combines the very large flower clusters of "Theodore Payne" with the dark blue flower color of Julia Phelps, which possibly is a hybrid of a species similar to *C. papillosus*.

So then quite evidently if these species did come from a common ancestral type they still have so much similarity that crossing among them occurs naturally.

To me it would seem that Wells exaggerates the monotypic nature of the chamise. Thus Jepson lists two species of the genus *Adenostema*: the chamise, *A. fasciculatum*, and the ribbonwood, *A. sparsifolium*. The chamise (or greasewood) has one listed variety, with bluish leaves called *obtusifolium*.

Actually botanists for some reason pass over the great amount of variation shown in the chamise. Probably because the flowers are white, it does not have the potential for color variation possessed by genera with colored flowers such as the genus *Ceanothus*. The leaf variation, as may be seen from Figures 2 and 3, is considerable. Not only does the color of the bark vary, but the leaves do also. The variety in which the leaves have three small forks at the ends of most of them would be given varietal status in *Ceanothus* if combined with a different flower color.

The question as to why these variations in *Adenostoma* have not become greater as time went on, whereas they have in *Ceanothus*, is one for evolutionists to answer. No clearly evident survival value has been linked with any given leaf type in *Ceanothus*. Yet radically distinctive leaf forms are found, many very lovely from the horticultural viewpoint. Oddly enough, though having the potential, the chamise never developed widely distinctive or lovely leaf patterns. Such differential behavior over a given period of time poses a real problem for evolutionists.

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Figure 1. *Ceanothus* plants grown from seed of Theodore Payne. Note the variations in the leaf size, upon comparing the plant held in the hand at the right with that at the left.



Figure 2. *Adenostoma fasciculatum* (greasewood), with typical linear needle-shaped leaves on the mature stem.

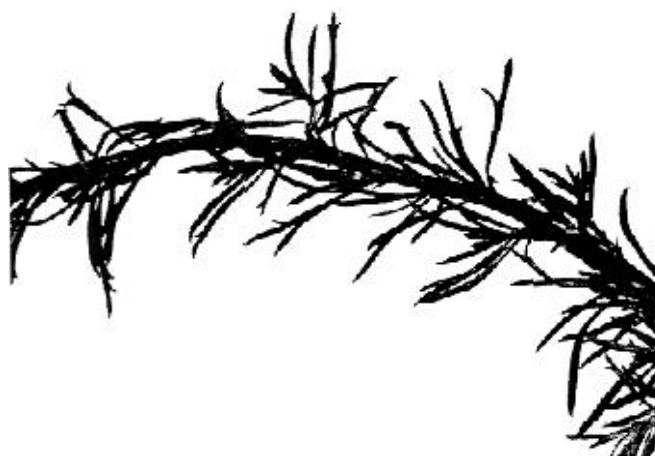


Figure 3. *Adenostoma fasciculatum* (greasewood), with variant three-forked leaves on a mature shrub.

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CREATION AND CREATIVITY – REMARKS ON THEIR PHYSICAL SIGNIFICANCE

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In this article the author discusses such questions as: "What is meant by Creation?"; "What is meant by calling a person creative?"; and "How can creation be reconciled with the laws of conservation as they are considered in physics?" It is concluded that on the human level, creation consists of giving a form to matter which already exists. Thus, what is called creation on the human level does not conflict with the laws of conservation. With respect to a level higher, human beings can see that both the matter and the form for it could be created; and this is the kind of creation described in Genesis.

What is the physical significance of the words: "creation" and "creativity"? What would be the consequence of the hypothesis that the phenomena described by these words obey the laws of physics, and do not occur except in physical systems?

Standard definitions in a dictionary¹ give these: (a) creation—the action of creating; to form from nothing (the creation of man), also the result of the action of creating; the creations of dressmakers. (b) creativity—the character of a creative person.

Might it be that the phenomenon of creation follows from a physical law or that it has been described, plainly and sufficiently explicitly, by such a law? First of all, let us try to find the physical significance of an act of creation.

Creation and the Laws of Conservation of Energy and of Matter

Creation, according to the definition, is the act of making from nothing. (Many philosophers have explained that "from nothing" means "not from something", i.e., not from pre-existent matter.) According to the physical laws of conservation of energy and of matter, in a closed system, the total amounts of energy of various sorts, and likewise that of matter, remain constant.

Might one conclude, then that the act of creation is essentially a metaphysical act, outside the domain of physical theory? Does it suppose, in fact, an origin and cause which is beyond the boundaries of this world?

That will depend on what is understood by the expression "make from nothing". If one states that a lake has been created, that could mean that the water—the matter contained in the basin of the lake—had been transported from the place where it existed before the creation of the lake. The same could be said about the energy necessary for the work. The amount of energy and of matter remains the same; things were merely moved from one place to another.

One might say the same about the appearance of living organisms. Suppose that there were no living organism on the face of the Earth, nothing but rocks in various geological formations and water without any trace of organic material. Still, all of the atoms of the chemical elements which would later enter into the structures of living beings would already be there. Likewise, there would be already in the Solar System all of the energy which would later animate the world as it is now known.

It is forms, then, which appear, develop, and disappear. But the matter of the universe seems to remain in the same amount. The creation of a form adds nothing to the amount of matter, nor does its disappearance take away anything. The law of conservation of matter is not involved.

The word "form", it will be noticed, is being used here in a sense much like that introduced by Plato and Aristotle, and developed by the Schoolmen.

But, it might be asked, is creation the appearance of a new form or of supplementary substance?

It is a matter of ordinary experience, as well as of scientific knowledge, that throughout an individual's lifetime the phenomenon of the appearance of forms is repeatedly observed. They come about by the passage of something from an amorphous, dispersed state, to a state in which the matter and energy are concentrated, and expressed in a structure.

Forms perpetuate themselves. One gives birth to another. They multiply, organizing matter into thousands of copies like themselves. This happens in the birth of living organisms, also in the production and reproduction by men of thousands of artificial objects.

But it is evident that some forms appear which have no precedents. To these forms one can apply the term "creation". It seems justifiable and useful to define creation as the act of making "not from a (preexisting) form".

If this definition is adopted, what physical law would be involved? Is there a law of conservation or non-conservation of forms? Is there a general law which governs the processes of the origin, reproduction, and disappearance of forms?

Creation, Conservation, Origin of Forms, and the Law of the Disappearance of Forms

There is indeed such a law in the exact sciences. It is stated in information theory as Brillouin's principle. In statistical physics it is known as Boltzmann's formula of the increase of entropy in a closed system. In thermodynamics, the science which is concerned with exchanges between thermal and mechanical energy, it is named after the great French scientist Sadi Carnot; it is called Carnot's principle.

The various statements of this principle are all to the effect that in all closed systems the average internal order decreases with time. The natural development of such a system tends to an amorphous, homogenous state, in which all of the initial structure or order has been dissolved or has disappeared.

But it is plain that in the birth and development of a living organism the opposite happens. Order increases, at least locally; the structures develop and become more complex.

However, as long as an organism lives in an open system, what has just been noted does not contradict the law of increase of entropy. This is because the law has been formulated only for closed systems. Due to exchanges with the environment, the principle of entropy increase is not violated, although locally order increases and entropy decreases. Calculation or physical observation show why: the increase of entropy in the environment is greater than the decrease in the organism itself. (The environment will include everything with which the living organism comes into contact. In particular, it includes the nourishment which the organism takes in.) There are, then, no phenomena known which are in opposition to Brillouin's (or Carnot's) principle.

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It would seem well founded, then, to say that neither birth (reproduction) nor creation (of form) can be accomplished except in open systems.

The existence of an open system, however, while it seems to be a necessary condition, is not always a sufficient one. There are two points to be considered here.

First of all, a supply of energy, and of matter, whether it be food or something else, are not enough to cause entropy to decrease, even locally. Consider the Sun's rays falling on a pond of water. There is a supply of energy, all right; but the effect is to heat the water and increase its entropy. But the same rays might be focused on the boiler of a Servel type refrigerator, and then the water would be cooled, and the entropy decreased. (Even so, entropy would increase elsewhere.)

What makes the difference? The refrigerator is already a fairly ordered, complicated, structure. It would appear that for order to increase, even locally, there must already be a considerable amount of order present. So the claim, sometimes encountered, that a supply of energy, such as that from the Sun, is a sufficient cause to effect such an increase in order as would have to occur in alleged evolution "from molecules to man" is not scientifically founded. (Or proved.)

Here we can clearly see what is the thermodynamical difference between Creation and creation. The former can appear anywhere while the latter only in zones—or in relation to zones—where an order is already present. Both can operate, however, *within* the framework of the second law, although for none of them that law constitutes a *sufficient* condition.

As for the second point, consider algae, floating in the ocean. They need only free access to the water containing minerals and to solar radiation. To them, to be open means to be surrounded by a membrane which is semi-permeable to water and to mineral salts, and which is transparent to light.

The decrease of entropy of the algae is possible because of the increase of entropy of the system of Sun and Earth as a whole. This comes about through radiation. One might thus say that the algae absorbs from its environment a negative entropy, or, negentropy.

The algae is an example of an open system—open to the flux of negentropy. It is also an example of a passive system. Among more complex animals it is otherwise. Among them, one may observe an active pursuit of that flux of negentropy. For instance, complex animals hunt for regions where food is abundant, the supply of oxygen sufficient, and the temperature suitable. This is in a way a creative attitude. While the animal is presumably not conscious of it as such, only the animal's involvement makes the work possible.

These things become more complicated when the analysis is extended to human beings; but the complication can be turned to the advantage of the creationist viewpoint.

Among human beings, this work of creation is realized on two levels: both by interior development, both of the body and of the spirit, and by external works, carried out by man either individually or collectively.

But here, too, such an achievement is not possible on either level unless through being coupled to a source of

negentropy. This coupling may be realized if the man constitutes an open system and moreover, as experience shows, an active one.

Here the words "open" and "active" signify more than in the plant or animal kingdoms. A man, like other living organisms, needs to be open to the circulation of nourishment, of water, and of fresh air with sufficient oxygen. But it may happen that, despite a mechanical access to the source of negentropy, there is no real, profound access. This may come about for the most subtle reasons, such as inhibiting thoughts, bad states of spirit, or others.

It may come about that although a man has physical access to that source he may yet remain far from it, on the surface of things. Indeed, he is using only a small percentage of the flux of negentropy which he might if his trouble did not exist. Such a small percentage permits him only to perpetuate his existence; all his faculties, all his possibilities, and indeed all in him which is really man, are "asleep". By considering such a case, one may see the significance of the word "active". Active means striving to approach the source.

Thus by doing all in his power to ensure first a mechanical access, and everything possible toward a real access, a man may approach the source and find himself illuminated and in harmony with the law of increase of entropy.

Christians, of course, see the Source, of negentropy as of everything else, as God Himself. And they try to approach by being in the right relationship with Him. Most other monotheists would agree in this.

Others seek the same thing by external works, such as scientific, artistic, or artisanal creativity. Yet others turn to internal methods, such as the formation of character, meditation, the practice of yoga, and other such ways. (It is not the purpose of this article to inquire how well such attempts succeed.)

Now it is possible to give a precise meaning to the word "creativity". Creativity is the character of a creative person. Who is creative? A creative person is one who does communicate with the source of negentropy.

May one final point be made? Human beings know that they can create in a limited way, as has been noted; the individual can put the form into the matter. Then, it is natural to suppose that there is One more powerful, Who can also create the matter itself. And this One, as Thomas Aquinas used to say, is He Who is called God. And this work of creation, of matter as well as of the forms which it then took, was His work of creation in the beginning.

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ANOTHER THEORY OF GRAVITATION: AN ALTERNATIVE TO EINSTEIN'S GENERAL THEORY OF RELATIVITY†

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The second of Einstein's two relativity theories, his general theory of relativity, is a theory of gravitation. Its wide acceptance and his original fame may be attributed largely to the presumed verification of predictions that he made relative to three effects in astronomy. Now, however, it turns out that all three of these effects should have been expected from other considerations; they can be shown to follow from more conventional physical analyses without the need for his theory and its rather drastic "nonphysical" concepts. A theory of gravitation is developed in this paper that follows the same analytical form as that which has proved to be so successful in electric theory, namely the form of Maxwell's four field equations in his electromagnetic theory of light. This theory yields all of the applications known from Newton's theory of gravitation plus the "expected" dynamical effects of gravitational waves and radiation, minute effects that Newton failed to provide for. If this new theory of gravitation is accepted, it will greatly alter the foundations of modern cosmology. Although the predicted gravitational radiation effects have the same order of magnitude as Einstein's, there is enough difference in value that if these effects are ever measured with sufficient accuracy this theory may be the "winner". This theory has not yet been completely explored; but it appears to be a satisfying alternative to Einstein's general theory of relativity, with much greater physical plausibility.

Introduction

The universal law of gravitation developed by Sir Isaac Newton is the law that is employed in practical problems related to gravitation. For example, it is the law that has been used so successfully in space flights, accurately predicting the trajectories of space crafts in their flights to the moon, and beyond.

However, without detracting from the genius of Newton, nor of the applicability of his law of gravitation, it appears that this law is a limited one. It is an *action-at-a-distance* law, meaning that its force is supposed to act throughout space instantaneously. Whereas it is believed that this gravitational effect is propagated through space with a finite velocity, not an infinite velocity.

Action-at-a-distance laws in other areas of physics have been shown to be limited laws, holding only for those cases where the travel time can be neglected. The effects have actually been found to be propagated with the speed of light.

After developing his *special theory of relativity*, from which the useful concept of equivalence of mass and energy was deduced, Albert Einstein developed a second theory of relativity known as the *general theory of relativity*, a theory of *gravitation*. It is not a simple extension of his special theory, but a complete venture into new concepts. These new concepts associate gravity with accelerated frames of reference and include the concept of "curved space". This concept of "curved space" appears to be a "nonphysical" and inconsistent concept in relativity; because special theory of relativity is based on the assumption that space is not a measurable physical quantity, that there is no fixed frame of reference in space.

Even though the general theory of relativity appears to be "nonphysical", this theory gained wide acceptance and gave Einstein his first fame. His fame came when observations apparently verified predictions that he had made. He predicted three effects in astronomy, but these Einstein effects can now be accounted for by other means. The general theory is not needed to produce any of these effects. Nevertheless Einstein's general theory of relativity is still used as a foundational principle upon which modern cosmology rests.

The Three Einstein Effects

The three effects predicted by Einstein¹ are: 1) A slight revolving motion of the elliptical orbit of a planet (the advance of its perihelion), 2) A slight curving of light rays by gravitational attraction, and 3) A redshift in the spectral lines of light emitted from very massive stars, or even from the Sun.

All of these effects are considered to have been observed:

1) The orbital motion effect has been measured on Mercury.

2) The bending of light rays from stars by the gravitational field of the sun is believed to have been observed during solar eclipses when observational conditions were optimum.

3) The redshift associated with some stars has been interpreted as a gravitational effect.

Several scientists have deduced these three effects by other theories. One of the most impressive demonstrations of an alternate means of deducing the three effects, without recourse to general relativity, is developed in the paper by L. Rongved entitled, "Mechanics in Euclidean Terms Giving All Three Einstein Effects".²

The authors of this paper have deduced these effects in still another way. Hence there is ample evidence that one does not need the general theory of relativity to predict these effects and they are not "proofs" of that theory. Discussion here will be confined mainly to the first two effects, however.

An Alternative Theory of Gravitation

A theory of gravitation is developed in this paper as an alternative to the general theory of relativity. This theory is developed from the same type of physical concepts that have been successful in electromagnetic theory. It employs the same form as that in Maxwell's four field equations. There are four field equations in gravitation and they contain four *field vectors* that are analogous to the four electric and magnetic field vectors of Maxwell's electromagnetic theory. This gravitational theory yields, besides the three things mentioned, all the "expected" dynamical effects that Einstein's theory yields, such as transverse gravitational wave radiation from accelerated masses and a finite propagation speed.

Gravitational solutions are obtained that are similar to classical solutions in electromagnetism theory. For example, the same type of solution is obtained for the gravitational power radiated from a revolving binary star system as from quadrupole radiation in electromagnetic theory.

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It should be noted, however, that the computed magnitudes of these gravitational effects are quite small compared with the analogous electromagnetic effects, making them much more difficult to measure. Nevertheless this theory should convince one that these "over and above Newtonian effects", such as gravitational radiation are physically plausible because they follow from this development in the familiar electromagnetic theory form.

Fundamentals of the Theory

Gravitational field theory is developed from field equations that have the same form as Maxwell's field equations. To facilitate the development, four gravitational field vectors $\mathbf{d}$, $\mathbf{g}$, $\mathbf{h}$, and $\mathbf{b}$, are assumed. They are respectively analogous to the four Maxwell electromagnetic field vectors $\mathbf{D}$, $\mathbf{E}$, $\mathbf{H}$, and $\mathbf{B}$. Then *four gravitational field equations* are postulated, namely:

$$\nabla \cdot \mathbf{d} = -\rho \quad (1)$$

$$\nabla \cdot \mathbf{b} = 0 \quad (2)$$

$$\nabla \times \mathbf{h} = \mathbf{J}_m - \frac{\partial \mathbf{d}}{\partial t} \quad (3)$$

$$\nabla \times \mathbf{g} = \frac{\partial \mathbf{b}}{\partial t} \quad (4)$$

where ρ is mass density and $\mathbf{J}_m$ is mass current density ($\text{kg}/\text{m}^2\text{sec}$). The sign on the right side of Equation (1) is the negative of that in the analogous Maxwell equation because gravitational *attraction* has replaced *repulsion* in the electrical analogy. Three additional postulates are made that are analogous to those in electromagnetic theory, namely:

$$\mathbf{d} = \epsilon_g \mathbf{g} \quad (5)$$

$$\mathbf{b} = \mu_g \mathbf{h} \quad (6)$$

and

$$\mathbf{F} = m\mathbf{g} + m\mathbf{b} \times \mathbf{v} \quad (7)$$

in which ϵ_g and μ_g are analogous to permittivity and permeability and $\mathbf{F}$ is the force of the gravitational field on point mass m .

In the *gravostatic* case Equation (7) reduces to the familiar $\mathbf{F} = m\mathbf{g}$ (8) and Newton's gravitational law applies. Hence, for point mass m at distance r from spherical mass m'

$$m\mathbf{g} = \frac{Gmm'}{r^2} \quad (8)$$

yielding the familiar Newtonian equation for the acceleration of gravity

$$g = \frac{Gm'}{r^2} \quad (9)$$

where G is the universal gravitational constant.

From Equations (1) and (5) one may easily show that the gravostatic field $\mathbf{g}$ at distance r from the spherical mass is of magnitude

$$g = \frac{m'}{4\pi\epsilon_g r^2} \quad (10)$$

Equating (9) and (10) yields $\epsilon_g = \frac{1}{4\pi G}$ (11) from which one may evaluate the constant ϵ_g .

Gravitational Poynting Theorem

A gravitational Poynting Theorem may be derived from Equations (3) and (4) in the same way that the electromagnetic Poynting Theorem is derived.³ The gravitational Poynting's theorem, is

$$\oint (\mathbf{g} \times \mathbf{h}) \cdot \mathbf{n} dS = \oint (\mathbf{g} \cdot \frac{\partial \mathbf{d}}{\partial t} + \mathbf{h} \cdot \frac{\partial \mathbf{b}}{\partial t}) dV \quad (12)$$

The *gravitational Poynting vector* is $\mathbf{g} \times \mathbf{h}$. It gives the intensity (the power flow per unit area) in a gravitational

wave. Similarly the energy density u in a gravitational wave or field is⁴

$$u = -\frac{\epsilon_g g^2}{2} - \frac{\mu_g h^2}{2} \quad (13)$$

Gravitational Wave Equation

The gravitational wave equation is derived by the same mathematical processes employed in deriving the electromagnetic wave equation.⁵ For an unbounded region with constant ϵ_g and μ_g and containing no masses, the wave equation is

$$\nabla^2 \mathbf{g} = \mu_g \epsilon_g \frac{\partial^2 \mathbf{g}}{\partial t^2} \quad (14)$$

and the speed

$$c = \sqrt{\mu_g \epsilon_g} \quad (15)$$

It is assumed that the speed c of the gravitational wave is equal to the speed of light, but Equation (15) holds whether or not c is equal to the speed of light.

$$\text{From Equations (11) and (15)} \quad \mu_g = \frac{4\pi G}{c^2} \quad (16)$$

So μ_g can be evaluated from the known values of the gravitational constant and the speed of light.

Applying the same type of theoretical development as in electromagnetic theory shows that these gravitational waves are *transverse* waves and have an *intrinsic gravitational impedance* of free space

$$\eta = \sqrt{\frac{\mu_g}{\epsilon_g}} = \frac{4\pi G}{c} \quad (17)$$

Gravitational Moments and Induction Field

Gravitational moment $\mathbf{m}$ is, by analogy with *magnetic moment*, defined for a mass current density distribution $\mathbf{J}_m(\mathbf{r}')$ in volume V' as

$$\mathbf{m} = \frac{1}{2} \int \mathbf{r}' \times \mathbf{J}_m(\mathbf{r}') dV' \quad (18)$$

The magnetic moment of a spherical mass M spinning with angular velocity ω has the familiar form

$$\mathbf{m} = \frac{1}{5} M r^2 \omega \quad (19)$$

The *gravitational induction field* $\mathbf{b}$ at distance $\mathbf{r}$ in direction $\mathbf{n}$ from the gravitational "dipole" moment $\mathbf{m}$ is, by analogy with the familiar induction field of a magnetic

$$\text{dipole,} \quad \mathbf{b} = \frac{\mu_g}{4\pi} \left[\frac{3\mathbf{n}(\mathbf{n} \cdot \mathbf{m}) - \mathbf{m}}{r^3} \right] \quad (20)$$

This induction field ordinarily has a negligible magnitude but it is important in gravitational radiation.

Perihelion Advance and Light Bending

Two phenomena that have been commonly considered to be governed by the general theory of relativity are the advance of the perihelion of Mercury and the bending of star light in the sun's gravitational field. These phenomena are, however, questionable "evidence" for the general theory of relativity.

One may obtain the famous results of the advance of the perihelion of Mercury and the deflection of starlight using the concepts of special *relativity*, without recourse to the general theory of relativity. This is achieved by using a set of inertial frames of such small size that the gravitational field can be considered to be locally uniform. Utilizing the Lorentz transformations between coordinates systems and associating the primed with the frame at "rest" and the unprimed with a *falling* frame, one obtains

$$dt = \frac{dt'}{\sqrt{1 - 2\phi/c^2}} \quad (21)$$

and

$$dr = dr' \sqrt{1 - 2\phi/c^2} \quad (22)$$

where $\phi = \frac{Gm}{r}$ = gravitational potential, and dr' = incremental displacement in the radial component of the primed coordi-

nate system. This represents a translation of the clock rate and scale length in a gravitational field.

From special relativity the total energy of a particle is⁶

$$p_x^2 + p_y^2 + p_z^2 + m_0^2 c^2 = E^2/c^2 \quad (23)$$

where p_x , p_y and p_z are the components of the momentum, m_0 is the mass of the particle, and E is the total energy. Transforming to spherical coordinates and utilizing Equations (21) and (22) and Hamilton-Jacobi theory, one obtains the advance of the perihelion of any planet in a grav-

itational field, namely
$$\delta\phi = \frac{6\pi Gm}{c^2 a(1-e^2)} \quad (24)$$

where $\delta\phi$ is the angular advance of the perihelion of the planet per revolution and e is the eccentricity and a the semi-major axis of the ellipse. If one assumes that $m_0 = 0$, as in the case of a photon, the deflection of starlight may be shown, by an extension of this analysis, to be

$$\Delta\phi = \frac{4Gm}{c^2 r} \quad (25)$$

Here $\Delta\phi$ is the deflection angle and r is the distance of the ray from the sun at closest approach.

Gravitational Radiation from an Accelerated Mass Particle

Both the general theory of relativity and theory of gravitation as developed in this paper may be used in the study of the generation of gravitational radiation. Utilizing the gravitational vector potential equation

$$\mathbf{A}_g = \frac{\mu_g}{4\pi} \int \frac{\mathbf{J}_m dV}{r} \quad (26)$$

and following standard mathematical methods similar to those employed in electrodynamics, the gravitational field of an accelerated particle of rest mass m_0 is, at velocity

$$\mathbf{v} \ll c, \quad \mathbf{g} = -\frac{Gm_0}{r^2} (\mathbf{n} - \beta) - \frac{Gm_0}{cr} [\mathbf{n} \times (\mathbf{n} \times \dot{\beta})] \quad (27)$$

where $\mathbf{n}$ is unit vector in the direction of the field point with respect to the particle, the dot indicates differentiation with respect to time, and $\beta = \mathbf{v}/c$ (27')

Employing the relationship $\mathbf{b} = \nabla \times \mathbf{A}_g$ (28)

and Equation (26), one can show that $\mathbf{b} = -\frac{\mathbf{n} \times \mathbf{g}}{c}$ (29)

Utilizing the $1/r$ term in Equation (27) and assuming that $\mathbf{v} \ll c$ one obtains the total power radiated from an acceler-

ated particle
$$\text{Power} = \frac{2Gm_0^2 \dot{\beta}^2}{3c} \quad (30)$$

Gravitational Quadrupole Radiation

Starting with the vector potential Equation (26) and employing methods similar to those in electrodynamic development, the quadrupole power radiated by gravitational bound systems, such as double star systems, may be obtained. It is readily apparent that the dipole term goes to zero because $m_1 r_1 = m_2 r_2$, where m_1 = mass of star one, m_2 = mass of star two, r_1 = distance of star one from center of gravity, and r_2 = distance of star two from center of gravity. Therefore, one must go to the quadrupole term. The gravitational power radiated is given by⁷

$$\text{Power} = \frac{G}{180c^5} \sum_{\alpha\beta} |\ddot{Q}_{\alpha\beta}|^2 \quad (31)$$

where
$$Q_{\alpha\beta} = \int (3x_\alpha x_\beta - r^2 \delta_{\alpha\beta}) \rho(x) d^3x \quad (32)$$

and

$$\ddot{Q}_{\alpha\beta} = \frac{\partial^3}{\partial t^3} Q_{\alpha\beta} \quad (33)$$

and $\rho(x)$ = density of matter. The result for a double star

system is
$$\text{Power} = \frac{32G}{20c^5} (m_1 r_1^2 + m_2 r_2^2)^2 \omega^6 \quad (34)$$

in which $\omega = 2\pi/T$, T = period of revolution of the double star. This differs from the value given by the general theory of relativity, being only one fourth as large as that in the general theory of relativity. Present measurements cannot be used to confirm either of these gravitational radiation values; but if future experimental results yield the smaller value it would support the theory developed in this paper.

Conclusion

A gravitational field theory has been developed from four field vectors that are analogous to the Maxwell field vectors. This is much simpler than the gravitational field of general relativity where *ten* field potentials are required.⁸ This theory appears to yield all of the important physical phenomena expected, but with enough difference in the quadrupole radiation intensity, compared to general relativity, so that future experimenters may be able to develop confirmation or rejection to this theory.

Acknowledgement

The authors wish to acknowledge the valuable assistance of Editor Harold Armstrong on the physics involved in this paper and for calling attention to numerous literature references.

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- ³Barnes, T. G. 1965. Foundations of electricity and magnetism. D. C. Heath and Co., pp. 155-159.
- ⁴The negative signs, which arise here but not in the electromagnetic case, can be interpreted by considering that the quantities $\epsilon_{gg}^2/2$ and $\mu_{gh}^2/2$ represent the "exhaustion" of gravostatic and gravomagnetic potential energy density. Hence the negative signs in Equation (13) are required to express these quantities as increases in gravostatic and gravomagnetic potential energy density. (For more about this notion of exhaustion see Heaviside's work, cited in Note Added.)
- ⁵Barnes, *Op. cit.*, pp. 284-287.
- ⁶Eisenberg, Jacob L. 1961. Fundamentals of modern physics. John Wiley and Sons, New York, p. 35.
- ⁷Landau, L. and E. Lifshitz 1951. The classical theory of fields. Addison-Wesley Press, p. 206.
- ⁸Sciama, D. C. 1971. Modern cosmology. Cambridge University Press, pp. 110 and 111.

Note Added: After this manuscript was submitted the Editor called attention to a paper written in 1893 by Oliver Heaviside entitled, "A Gravitational and Electromagnetic Analogy". It may be found in Heaviside's *Electromagnetic Theory*, reprinted by Dover, 1950. Unabridged Edition, Vol. 1, Appendix B, pp. 455-465. Heaviside proposed Maxwell-type equations for gravitation. It is encouraging to the authors to learn that much of their challenge to Einstein's gravitation theory is supported by this brilliant analysis of Heaviside.

Unfortunately the Heaviside paper did not go as far as one would wish. For example, it did not spell out some basic equations, such as Equation (7) of this paper; nor did it go into radiation from twin stars to afford a basis of comparison with Einstein's work. (Of course, Einstein's work had not been done in 1893.) However, Heaviside's insight into the concept of field energy proved very helpful to the authors, and prompted some alterations which have been included in this paper.

Editor's Note: Perhaps it might be better to say that the precession of the perihelion of Mercury is compatible with the theory of relativity, rather than predicted by it. For the behavior of the peri-

helion was known at least as early as Leverrier's work, about the middle of the last century. Toward the end of the century Newcomb, having studied the matters very extensively, concluded that there are several anomalies in the orbits of at least the four innermost planets. See Poor, Charles Lane 1922. Gravitation versus relativity. G. P. Putnam's Sons, New York. (See also Morgan, Herbert R., 1930. The observed motion of the perihelion of Mercury, *Journal of the Optical Society of America*, 20 (4): 225-229. The theory of relativity, it appears, helps with some of these anomalies, leaves some unchanged, and actually makes some worse.)

The two other effects of Einstein were not looked for evidently until the question of relativity had been raised. Actually some scientists have questioned whether the explanation given by relativity is really needed. See Poor, *Op. cit.*; also Burns, Kevin, 1930. A comparison of laboratory and solar wavelengths, *Journal of the Optical Society of America*, 20 (4): 212-224; also Poor, Charles Lane, 1930. The deflection of light as observed at total solar eclipses, *Journal of the Optical Society of America*, 20 (4): 173-211.

For an attempt at a theory of gravitation analogous to a theory of electrodynamics rather different from the Maxwellian one, see Ritz, Walther, 1908 and 1909, in papers collected in his *Oeuvres*,

published in 1911 by La Société Suisse de Physique and Gauthier-Villars, Paris, pp. 419-422 and 462-492.

Further Editor's Comment

If anyone should ask what this topic has to do with Creationism, it is relevant in at least three ways. In the first place, gravitation and related matters have to do very closely with cosmology and cosmogony; and those topics clearly have to do with Creation. In the second place, it is possible that consideration of the radiation of energy through gravitational waves might help to prove the youth of the universe, by setting an upper limit on the ages of double stars, planetary systems, etc.

The third point is a little different. According to the theory proposed here, gravitation and electrodynamics are very closely analogous. When similarity is found in living beings, evolutionists often claim that it is evidence of descent. But surely no one will maintain that the electromagnetic field descended from the gravitational, or vice versa. Rather, the similarity is due to the Designer's use of one basic plan, with variations. Having seen this happen in inorganic nature, creationists shall not be surprised to see the same kind of thing among living beings. There, too, the similarities point to the Designer's methods, and have not necessarily anything to do with descent.

DARWIN DENIED: THE SUPERSTITION OF STOCHASTIC SUCCESSION

ROBERT W. BASS*

The scene is a meeting of experts to discuss the reality, or otherwise, of UFO's. The narrator is a physical anthropologist whose avocation is exobiology. Pictures, alleged to be of the crew of a UFO, have just been shown. As the curtain rises, the narrator is commenting on the pictures.

Excerpts from Fictional Novelette

"Have those artfully staged photos fooled you all? Look at the slides of the alleged UFO-nauts. Unmistakably human beings! Don't you gentlemen know what the mathematical odds are against the random evolution on another biosphere of creatures so extraordinarily like ourselves? Haven't you read George Gaylord Simpson's, 'On the Non-prevalence of Humanoids?'"¹ Or Harold Blum's independent corroborative calculations?²

"Even if we consider our present planet Earth to be starting all over again, back in the days when it had a reducing atmosphere, some four billion years ago, the odds against the evolution of sentient beings similar to ourselves were easily 10^{18} to one! Isaac Asimov has shown that the total number of different possible genomes existing in the visible universe is less than 3×10^{63} , while the total number of possible genomes exceeds 3×10^{622} ."

"Garrett Hardin's figure for the latter is 10^{3000} ; Hardin assumes that only one in a million million million million gene combinations is viable, but that would still leave 10^{2970} adaptive peaks theoretically possible."³

"At any rate, no matter how you calculate it, the chances of humanoid evolution a second time anywhere else in the universe is negligibly small!"

"Excuse me," interrupted Porterhouse, "but Professor Asimov himself has partially countered that argument, by demonstrating the functional advantages of approximately humanoid form: two eyes, for stereoscopic vision; brain near eyes for rapid responses, etc. Also, Carl Sagan has pointed out that if we are considering only a single pathway, then we have to multiply probabilities, and the product soon becomes negligible; but if there are many parallel paths to an approximately similar end, then we have to add the probabilities."

"There may be only one chance in a billion of exactly human life evolving under certain conditions, but if there are a billion other possible, viable kinds of creatures who phenotypically resemble the humanoid gross morphology, to the point where a superficial external inspection would accept identity (without consideration of biochemical differences), then the probability of evolution of a humanoid being could be so high as to have order of magnitude unity."

"Your logic and mathematics are correct," I replied, "but your assumptions are completely unsupportable. The well-proved principle of genetic homeostasis shows that as soon as you start to get away significantly from an adaptive genome, sterility or inviability sets in and drastically limits the amount of departure available." (See References 13 and 18.)

"Granted," replied Porterhouse, "but if you follow that line of evidence to its inevitable conclusion, you arrive at the result that the theory of macro-evolution (beyond species, genera and families to actual transformation of orders) by random point-mutations and Darwinian natural selection (differential reproduction)—that is, the conventional theory of stochastic macro-evolution—falls of its own weight as a mathematical absurdity." (See Reference 19.)

"Surely you aren't serious?"

"Indeed I am," answered Porterhouse. "Haven't you read my book, *Darwin Discredited: the superstition of stochastic succession?*"

"Teleology!" exclaimed Damsel, picking up a copy of his magnum opus, *UFO's*.

"Orthogenesis!" blurted I, grabbing a Morocco-bound gilt-edged copy of my monograph on exobiology.

"Vitalism!" snapped Amizov, clutching a fat paperback edition of his masterpiece, *Amizov's Amazing Assorted Assertions*.

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"Mysticism!" expostulated Zägen, grasping at his latest-edited symposium proceedings, *Transactions with Unearthly Mentalities*.

"Gentlemen," interjected the chairman, "surely we all accept that every man is entitled to his own *Weltanschauung*. Obviously Dr. Porterhouse believes in Divine Special Creation. But who among us does not have his own preconceptions and unconscious biases?"

"Pardon me, Al," continued Porterhouse, "but I don't agree that my theology has influenced my biology. I keep my roles as a theist and as a scientist quite distinct. When I am operating as a scientist, I play by exactly the same rules as do the rest of you."

"Hummpphh!" snorted Damsel.

"In fact, I would go so far as to say that my religious commitments may have caused me to examine neo-Darwinism far more objectively than have some of you. As a theist, I accept Creation as all important. This gives me an enormously powerful, non-scientific, emotional motivation for wanting to get to the bottom of the matter. I still use precisely the same scientific method as always, but learning the answer now takes on a life-or-death importance to me. Therefore I cannot be content with some of the superficial and slipshod modes of reasoning commonly prevalent in this field."

"How many of you are familiar with the war now raging in *Nature* in the field of molecular biology between the so-called selectionists and the neutralists?⁴ Consider amino-acid sequencing in proteins such as cytochrome C. There are variants due to point mutations in one of the corresponding DNA codons, but all biochemical, cytological and morphological investigations show that none of these variants have any selective advantages whatsoever among themselves; as regards differential reproduction they are demonstrably neutral."

"Hence the percentages of each variant appearing in different species having the protein otherwise identical should be the same, and should be proportional to the likelihood of the relevant point mutations, if the theory of stochastic evolution is true. Yet, for example, the horse has, 100 percent, one particular variant; and the donkey invariably has the other! This conclusively establishes that some force or influence other than Darwinian natural selection is at work."

"Not so fast, Dr. Porterhouse," I butted in, "let me reply to that point. You may be right. But there is recent evidence suggesting that evolution is governed, not by mutations in structural genes, but by mutations in regulatory genes. Protein-wise, chimps and humans are virtually identical, yet during morphogenesis subtle alterations in rates, sequencing and so on produce vastly different phenotypes. Until this is all unravelled, you can't make your last argument stick."

"Well, what about Lewontin's Theorem in mathematical genetics, utilizing the concept of information as precisely analogous to negative entropy, and proving that during stochastic evolution the information content of the genome cannot increase.⁵ That in itself decisively destroys macro-evolution! Have you read profound geneticist Goldschmidt's 1940 Yale lectures, *The Material Basis of Evolution*,⁶ in which he poses a score of challenges to stochastic macro-evolution that have not been resolved to this day?"

"Have you read formerly orthodox research geologist and palaeobotanist Derek V. Ager's, *The Stratigraphic Record*,⁷ in which after years of global observations he con-

cludes that, far from upholding uniformitarianism, the stratigraphic record is actually one long record of global catastrophes of such magnitude that he cannot conceive any alternative to the hypothesis of causation by extra-terrestrial phenomena?"

"Have you read Nitro-Nobel Medalist, physical chemist, Melvin Cook's, *Prehistory and Earth Models*,⁸ in which he demonstrates by nuclear physics that the long-term radiometric dating methods, the so-called U-Th-Pb clocks, yield everywhere systematic anomalies that can be explained perfectly by, but are incompatible with any other hypothesis than, a large extra-terrestrial neutron flux (e.g. from a nearby supernova); but if you accept this impressive evidence of a flux, you have to admit, don't you, that the hands of the clocks would have spun wildly, and so long-term radioactive time would be meaningless?"

"What about Cook's radiocarbon-imbalance proof that the Earth's present atmosphere can't be more than 30,000 years old? What about his anomalous terrestrial helium efflux, that so impressed the Editor of *Nature*, that likewise sets the identical upper limit to the age of this planet's atmosphere?"

"What about profound palaeontologist Schindewolf's conclusions, painstakingly demonstrated in his monumental, *Grundfragen der Paläontologie*,⁹ that the fossil record, viewed objectively, presents the diametrical opposite of the pattern that it should present if neo-Darwinism were true? Schindewolf concluded that an intellectually honest palaeontologist would have to hypothesize that one day a reptile egg-shell cracked open and a bird walked out! (This is Goldschmidt's 'macro-mutation'.)"

"What about palaeobotanist Heribert Nillson's explicit admission (See Reference 22) after studying the fossil record for 40 years from an evolutionary viewpoint that his basic hypothesis had been mistaken and that 'the gaps are real, they will never be filled.' An equivalent admission was made implicitly in 1972 by Harvard palaeontologist Stephen Jay Gould (See Reference 23) in the 'theory of punctuated equilibria', but now that amino-acid-racemization dating has demonstrated (but see Reference 24) that the entire geological column is less than a hundred thousand years old, Gould ought to revise the title of this theory to replace the word 'punctuated' by 'collapsed'."

"What about biochemist-physiologist Kerkut's demonstration,¹⁰ in his *Implications of Evolution*, that polyphyletic genesis, rather than monophyletic genesis, is the only hypothesis reasonably compatible with the hard evidence? Shades of Yale arachnid-specialist Alexander Petrunkevich's admission that only macro-mutations could account for the origin of spiders!¹¹"

"What about the Establishment commonplace that 'if you are going to allow macro-mutations, you might as well go straight back to Special Creation and have done with it,' on the obvious grounds that a macro-mutation would not be a mere saltation, it would be a miracle. Yet what about profound geneticist-embryologist C. H. Waddington's cytological observations of gross chromosomal changes, in a single generation, of established strains *in vitro*—heresy though it be?" (See Reference 20.)

"What about Nobel Laureate Sir Francis Crick's conclusion, decades after he and Watson cracked the secret of the double-helix structure of DNA, that the absolute universality of the genetic code—identical from bacterium to mammal—can most reasonably be explained (or explained away)

by his hypothesis of *directed panspermia*, namely that life originated (never mind how) on a planet of some other molybdenum rich star, and was deliberately seeded on Earth by some higher extra-terrestrial intelligences for . . .", he paused to chuckle, ". . . 'missionary purposes'!"¹² What about molecular geneticist Ohno's demonstration, in his hard-headed *Evolution by Gene Duplication* that homeostasis is so severe and so ubiquitous that neo-Darwinism is an absurdity?"¹³

"What about population-geneticist Richard Lewontin's agonized question, in a book (See Reference 25.) called by *BioScience* the 'most important book on evolutionary biology published in more than 10 years'; namely, 'How can such a rich structure as population genetics fail so completely to cope with the body of fact? Are we simply missing some critical revolutionary insight that in a flash will make it all come right . . . Or is the problem more pervading, more deeply built into the structure of our science?' " "Lewontin quite explicitly admits that population genetics fails to support evolutionary theory; in his own words: 'For many years population genetics was an immensely rich and powerful theory with virtually no suitable facts on which to operate . . . Quite suddenly the situation has changed. The mother-lode has been tapped and facts in profusion have been poured into the hoppers of this theory machine. And from the other end has issued—nothing. . . . The entire relationship between the theory and the facts needs to be reconsidered.' Isn't the 'critical revolutionary insight' that Lewontin sees as missing simply the elementary conclusion that maybe the very idea of evolution itself is what needs to be 'reconsidered'?"

"As an example of the profusion of hard facts which evolutionary population genetics, to Lewontin's consternation, has been unable to assimilate, let us return to the matter of protein polymorphism, the so-called 'molecular heresy', and combine certain recent results of pre-eminent theoretical molecular geneticists Kimura (See Reference 26.), Cavalli-Sforza (See Reference 27.), and Maynard Smith (See Reference 28.), as expounded by Kalinga Medalist Nigel Calder (See Reference 29.). Briefly, these results from blood-group typology and human hemoglobin amino-acid sequencing, after rigorous mathematical analysis and computer-processing, have demonstrated that *ALL living human beings of ALL present races have descended genealogically in less than a few hundred generations from a very small number of ancestral couples—Noah's family? —who lived in the Near East and were racially Semitic!*" [This startling quantitative result contradicts received opinion so sharply that detailed documentation, starting with pages 96 and 111 of Maynard Smith (See Reference 28.) and pages 28 and 97 of Calder (See Reference 29.), is provided in the Supplementary References.]

"What about pre-eminent mathematician von Neumann's statement that stochastic evolution is as likely as the creation of a mansion by a tornado in a brickyard? What about the very explicit statements by the discoverers of quantum and wave mechanics and the physical theory of chemical valences and molecular structures, Nobel Laureates Heisenberg, Schrödinger, Pauli, and Wigner, all of whom have stated that materialist microphysics (of which they were the creators) can *never* explain all biological phenomena and that some type of vitalism will have to enter the picture before life and consciousness can be scientifically explained?"

"What about Evan Harris Walker's resolution of the agonizing measurement problem in quantum mechanics—

how to formulate properly any experiment, including the instantaneous 'collapse of the wave function', without inclusion of the consciousness of the observer—by a theory of consciousness as the 'hidden variables' in quantum mechanics, which concludes that consciousness is 'real' but non-physical (in the sense of non-measurable), and has proved its viability by a dozen *quantitative* predictions about brain physiology, and about ESP and PK experiments, which have been confirmed experimentally?"¹⁴

"What about the Einstein-Podolsky-Rosen Paradox, which demonstrates that conscious thought can instantaneously alter the spin-state of an electron over an arbitrarily great distance? What about UCLA anthropologist Birdsell's book *Human Evolution* which, in its first edition, in a nobly objective chapter on "Human Evolution at the Second Level of Abstraction" admits quite explicitly that the simplistic story of evolution of the type propagated by such widely read popularizations as the LIFE-TIME Books is an adult fairy tale, and that the few true experts are loath to show the massive counter-evidence to any but the most advanced and trustworthy students, on the grounds that it might 'confuse' the public?"¹⁵

"What about Birdsell's admirably honest attempt at a mathematical evaluation of the theory of human evolution, in which, over a three-million year Potassium-Argon dated period, he plots the cranial capacities, in cubic centimeters, of australopithecus, pithecanthropus, and homo sapiens, ending with three essentially *parallel*, horizontal straight lines (at, respectively, 500, 1,000, and 1,500 cc's), thus leading, by his own words, to better than a 90 percent confidence-level conclusion than none of these three creatures can have had any genealogical relationship whatsoever?"

"Wait!", I interrupted, "I know that book well. In the second edition Birdsell corrected those mistakes you are referring to."

"Could it be that he was persuaded against his better judgment? After all . . ."

"Gentlemen! Please!" intervened the chairman. "This is neither the time nor the place to attempt to settle a controversy of such formidable magnitude."

"Although, as Chairman, I will permit myself the privilege of having the last word, by pointing out that the world's pre-eminent authority on the logic of the scientific method, Sir Karl Popper, clearly does not regard the theory of stochastic macro-evolution as a viably formulated, truly scientific hypothesis, *much less* a 'proved fact', as he has openly demonstrated in his ringing endorsement of Norman Macbeth's biting *Darwin Retried*¹⁶ in such words as ' . . . excellent and fair . . . most meritorious . . . a really important contribution to the debate . . . a truly valuable book'."

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SOME MEDIAEVAL THOUGHTS ON THE ARK

The shape and structure of Noah's Ark are subjects on which something has been written from time to time, both in the C. R. S. *Quarterly* and in other creationist literature. It may be of interest to notice some early writings on the subject.

Hugh of St. Victor, a theologian and teacher who lived around 1100 A. D., seems to have been much interested in the Ark. Some of his views have been set forth by Zinn, Grover 1971. Hugh of St. Victor and the Ark of Noah: a new look, *Church History*, 40 (3): 261-272. There is also a book: Hugh of St. Victor: selected spiritual writings. Translated by a Religious at C. S. M. V. Published 1962 by Faber and Faber, London. See especially pages 60-63.

Early in the Christian era Origen had set forth his views on the Ark. He considered that it was a sort of pyramidal structure. For a long time people were content to accept this view. St. Augustine, in accepting it, granted that such an Ark would have been most unseaworthy. But he supposed that it was kept safe by God's intervention.

Hugh, however, maintained that, where it is not stated that there was a miracle, then no appeal should be made to a miracle, until more understanding can be gained of what could be done in the order of nature. Apparently he studied the construction and use of ships, and came up with a completely different interpretation.

In fact, the Ark as Hugh envisaged it seems to have looked rather like the Arks of Noah which used to be so com-

mon as toys. He considered it to have been something like a house boat; it was a boat below, but had a house-like, or at least roof-like top. Hugh had some thoughts about the arrangement of the interior; one idea, which later writers do not seem to have taken up, was that aquaria for such animals as seals were in parts of the interior. He also suggested some considerations about the size, and how it would contain all the animals.

It is true that Hugh's interest in the Ark was not primarily along lines of naval architecture. Like most mediaeval theologians, he was very interested in the allegorical meanings of Scripture; and was able, of course, to find many in the account of the Ark. That there was a tendency for the mediaeval writers to be carried away by their allegories can hardly be denied.

It should be noticed, though, that they held, in theory at least, the validity of allegorical meanings was derived from the literal. Thus anyone who wanted to draw allegorical meanings from Scripture needed to be sure that the accounts were true to literal meanings; and, of course, Hugh and his contemporaries never doubted the literal truth of Scripture, including the story of the Ark.

In investigating how these accounts, accepted as literally true, can be in harmony with the nature of things, Hugh seems to have been a pioneer in the work which has later been taken up by modern creationists.

—Editor Armstrong

THE USE AND ABUSE OF ASTRONOMY IN DATING

DONOVAN A. COURVILLE*

The science of astronomy is of double interest to Bible-believing Creationists; for it has applications both to cosmology and cosmogony, and also to chronology. In both of these fields, however, not only uses, but also abuses, are possible, and, indeed, common.

Abuses in cosmology and cosmogony usually involve unwarranted extrapolation of data from the present to the remote past, or maybe to remote distances.

Abuses having to do with chronology usually involve mixing unwarranted assumptions in with the astronomical data, or in accepting one out of several possible interpretations of a record, and ignoring others.

In this article the author has examined several dates supposedly established by astronomical data. The dates are mostly from Egypt, and obtained by the Sothic method. In fact, these alleged results are very questionable; and alternate interpretations do not lead to conflicts with Scripture, when Scripture deals with Egyptian matters.

From the article title one could infer that there is a proper use of astronomy in establishing historical dates of antiquity. Less well recognized by the casual reader is the misuse and abuse of astronomical data to bolster a chronological structure that is sagging precariously from the increasing weight of controverting evidence.¹

1. Use of Eclipse Data in Dating

As for the proper use of astronomical data in dating, one thinks first of the use of eclipse data. The motions of the moon relative to the earth and of the earth relative to the sun have been accurately defined. This knowledge makes it possible to predict the exact time of first appearance, the duration, the degree of eclipse for a given area, and the area of best observance.

On the same basis, it is possible also to calculate back in time to date eclipse phenomena of antiquity in terms of the same details. Or conversely, if an ancient inscription refers to an observed eclipse in a stated area, it is then theoretically possible to determine the date of that eclipse on the B. C. time scale.

It might seem that with such a method at the disposal of chronologists, it would be readily possible to arrive at a chronology of antiquity, such that remaining problems were limited to refining a few dates between established eclipse dates. Actually, this is not at all the case.

The principal reason is the paucity of examples of eclipse records which provide adequate data for unequivocal identification of the eclipse record with a calculated eclipse. There is thus always the possibility that the eclipse record has been correlated with the wrong eclipse, thus leading to obscuring the truth rather than establishing it.

A second factor limiting the value of this method for dating purposes is the fact that only major eclipses have any genuine potential for dating. Partial eclipses are of such frequency that the chances for proper correlation are remote, thus leading to erroneous conclusions. Even a total or near total eclipse of the sun can be expected to have occurred within any period of a century or less in a given area.

Major eclipses of the moon are even more frequent. There is thus a potential for miscorrelation, even with major eclipses, unless the associated incident is already known with close approximation on the basis of independent data. This problem is well illustrated by the inability to unequivocally decide between two eclipses of the moon, separated by only four years, as a basis for deciding between two dates for the birth of Christ.²

The often indecisive nature of such data in dating is also strikingly illustrated by the series of eclipses provided by Ptolemy for the era 791 to 491 B. C. This series of data was long regarded as above question since the data seemed to match without flaw the series of calculated eclipses between these dates. More recently, the series has been questioned on the basis that Ptolemy did some "fudging" in the provision of other data,³ and if some things are fudged others may be suspected.

There seemed to be no question as to the correctness of the identification of the eclipse record dated to the 10th year of Assur Dan III, king of Assyria, with a calculated eclipse in 763 B. C. Yet even this date has been queried⁴ in favor of identification with a lesser eclipse in 791 B. C. Whether or not the bases for these queries are valid, they illustrate the uncertainty that is possible, even in cases that seemed to be altogether above question.

Unfortunately, there is no extant reference to any eclipse prior to the early 8th century B. C. which may be unequivocally correlated with a calculated eclipse. In a number of cases, used to assign or confirm dates, it is virtually certain that the phenomenon referred to was not an eclipse at all. In this category belongs the attempt to date Abraham in terms of an assumed eclipse of the sun on the basis that he would have had to see the stars in the day time to be rationally asked to number them.⁵

The same holds true for the attempt to date the Exodus in terms of an assumed eclipse as the cause of the plague of darkness and for the early attempt to date the crucifixion of Christ on the basis that the darkness of Matthew 27:45 was of such origin.⁶ In the latter two cases, moreover, the darkness is stated to have lasted too long to have had such an origin.

To these examples may be added the attempt to date Takelot II of dynasty XXII on the basis of an obscure inscription which has been variously translated. One such translation reads:

When now had arrived the 13th year, the month Mesorii, the 25th day . . . the heaven could not be distinguished; the moon was eclipsed (literally "was horrible") for a sign of the events in this land.⁷

A similar case is the attempt⁸ to date Necherophes of dynasty III from the note following that name in a transcription of Manetho's king list which reads: "In his reign the Libyans revolted against Egypt, and when the moon waxed beyond reckoning, they surrendered in terror".

There are other inscriptions in which an eclipse seems to be more clearly indicated, but the dates assigned to the accompanying incidents are not established to the point of permitting unequivocal correlation with a specific calculated eclipse. Examples of such misuse of data may be recognized in the attempt⁹ to date the destruction of Ur at the time

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of an eclipse of the moon, and to date Mursilis II of the Hittites by reference to an eclipse of the sun.¹⁰ These attempts depend on the traditional dates rather than provide any support for or confirmation of the dates.

A guiding principle in the use of such references for dating purposes could be stated thus: eclipse data *do not* confirm proposed dates except as adequate data are at hand to preclude any alternate interpretation. Disregard of this principle is clearly a misuse of astronomy.

To be sure, scholars have convinced themselves that the current views on ancient chronology have been settled within narrow limits, at least as far back as the XIIth Egyptian dynasty. The fallacy in such a belief follows from the fact that the ultimate support for this view of chronology is this same sort of abuse of astronomy that characterizes the misuse of eclipse data.¹¹

The validity of this chronological structure has been repeatedly challenged of late. One cannot arrive at *valid* conclusions by using that which remains to be proved as the basis of proof.

2. Use of Sothic Method as Abuse of Astronomy

When the archaeologist or historian speaks about "astronomically fixed dates", he is usually not referring to dates fixed by eclipse data. He is referring rather to dates assumed to have been fixed by the method known as the *sothic dating method*.

To refer to dates derived by this method as astronomically fixed is deceptive since the term infers that the dates are as unalterable as are the movements of the earth and the moon in their orbits. Evidently, the term has been sufficiently pretentious to have intimidated or discouraged scholars generally from even admitting a casual interest in a chronological view which lies outside the limits imposed by these "fixed dates."

Astronomical data *are* used by the method, but the interpretations of the data are based on premises that have never been established.¹² Consequently, from a scientific standpoint, these dates are no more certain than are the unestablished premises on which the interpretations rest.

The fact that the resulting chronological structure is characterized by a multiplicity of anachronisms and incongruities should be recognized as adequate basis for questioning the validity of these premises and of the dates derived by this method.¹³ To assume that the dates thus derived eliminate all defensible basis for further consideration of opposition evidence is an abuse of astronomy.

The alternate possibility remains that an assumed, but unwarranted, "fixation of dates" has provided the pressure for disregarding the increasing amount of opposition evidence and for the use of highly improbable, or even incredible, explanations to camouflage the difficulties. The acceptance of this method for providing dates in antiquity has never been universal among scholars.

3. Theoretical Basis for Sothic Dating Method

The basis on which the sothic dating method rests is not difficult to understand. It is based on references from ancient Egypt, indicating the use of a calendar composed of 12 months of 30 days each. Five additional days were added at the end of the year to bring the number to 365. However, the solar year is close to 365.25 days in length. In modern time, the calendar is kept in line with the seasons by adding an extra day as February 29 every fourth year.

A calendar uncorrected for this discrepancy i.e., without leap years would result in a wandering of New Years day

backward through the seasons at the rate of one day every four years. New Years day would then return to an original position in the seasons only after the lapse of 365×4 or 1460 years. This is the *sothic* period, or *sothic cycle*, sometimes referred to as the *sothic year*.

If one grants the use of such a "vague" calendar, at least throughout one sothic period,¹⁴ it would be theoretically possible to date on the B. C. time scale an incident defined in terms of a specific position in the 1460 year cycle. If from such data the extent to which New Years day has wandered is determinable, it would only be necessary to multiply the number of days by four to obtain the number of years elapsed from the beginning of the cycle.

4. Some Demands on Such a Dating Method

As with the use of eclipse data, before such calculations could provide *dependable* dates, certain minimal requirements must be met. Among such, the following are of critical importance:

(1) The date on the B. C. time scale for the beginning or ending of such a cycle must be known with certainty.¹⁵

(2) It must be known with certainty that such a "vague" calendar was in use, as demanded by the theory, without interruption or alteration, during the entire period for which the method is used for dating purposes.¹⁶

(3) Since there is no *necessary* relation between a 365 day calendar and a coincident use of the calendar as demanded by the sothic method (reasons noted later),¹⁷ references used as a basis for applying the method *must* provide clear evidence that such a relation existed. This is probably the most serious mistake that was made by earlier scholars in the interpretation of data in an unwarranted manner (more later).¹⁸

(4) Since it is known that at least one other calendar was in coincident use with this vague calendar,¹⁹ each application of the method should provide satisfactory evidence that the data given are in terms of such a vague calendar and not some other existing calendar.²⁰

(5) The dates presumed to be fixed by the scheme should lead to a chronological structure which is relatively free of major anachronisms and internal inconsistencies.²¹

If any one of these critical prerequisites for a dependable dating method is not met, the dates derived from its application *cannot* be rationally labelled as fixed, or even dependable as approximations. Short of meeting these demands, reference to dates derived by the method as "fixed" is an inexcusable deviation from the accepted rules of scientific procedure and of recognized principles of logic.

It is proposed to show that these supposedly fixed dates are the result of the same sort of faulty handling of data that supports the concept of evolution. The creationist who rejects the concept of evolution should not be misled into supposing that the first criterion to be met by his chronological views is that they shall not lie outside the limits imposed by this method of dating.

There is nothing more disastrous to arrival at truth than to regard concepts as fixed that do not merit any such evaluation. In the face of the multiplicity of anachronisms and incongruities that characterize the traditional chronological structure, there is no demand that these views be regarded as above the need of *gross* modification.

Thus far, the term calendar has not been defined. The term as here used does not refer to a published arrangement containing a sequence of the days of the month and months of the year which is the meaning of the modern term. The term refers only to the *method* by which the ancients referred to specific dates within the month or year.

As far as is known, the Egyptians had no word for expressing the modern concept of the word calendar. I will now discuss some of the problems that rise from the use of this scheme, and which invalidate the method as providing dates that can be properly labelled as "astronomically fixed."

5. What Phenomenon Marked the Beginning of the Cycle?

The label "fixed" as applied to dates derived by a sothic dating method, would seem to demand a clearly defined and defensible astronomical phenomenon for making the beginning of the cycle. This phenomenon is referred to in the Egyptian sources as a "Rising of Sothis," a phenomenon which wandered through the seasons along with the New Year of the vague calendar. To make the term definitive, it is taken to mean the *coincident* rising of Sothis (Sirius) with the sun (heliacal) on the wandering New Years day of the vague calendar.

One difficulty with this definition is that it is not possible to *observe* a coincident rising of Sirius with the sun, due to the excessive brilliance of the sun. It has been determined that Sirius must be above the horizon by at least 9° ahead of the sun for such visibility.²² This 9° is known as the *arcus visionis* and is equivalent to about 36 minutes of time.

However, many years ago, Poole calculated²³ the *actual* time between the position of Sirius relative to the rising sun on New Years day of the wandering calendar in 1320 B. C., the date *supposed* to represent the beginning of a cycle. His calculations were confirmed by the Astronomer Royal of England. The results indicated that Sirius was *not* 36 minutes ahead of the sun but rather one hour and 16 minutes high as would be observable at Thebes and little more than one hour high as observable at Memphis, farther to the north.

The astronomer MacNaughton concluded that the identification of Sothis with Sirius was incompatible with the ancient data, and devised an alternate chronology of Egypt based on the premise that Sothis was Spica.¹⁴ As far as is apparent, his reconstruction attained *no* significant acceptance. However, as an astronomer, he has provided much *factual* data in his work from which I have drawn freely.²⁵

The problem of this discrepancy has been a matter of consideration by a number of scholars and a number of different explanations have been offered. The most recent, and probably the most defensible, is that which proposes to account for the discrepancy on the basis of the movement of the sun among the stars during a period of 1460 years, together with perturbations in the earth's rotation.²⁶ This problem can be ignored, settled or unsettled, since there are other bases of far greater significance for recognizing the invalid nature of the sothic method for dating purposes.

6. When Did a Sothic Period Begin?

As noted above, no calculations are possible using this dating scheme, *except* as an established date for the beginning of a cycle is obtained. Currently, a period is regarded as having ended in the era 139-143 A. D. An era of four years is used to express the date since four years are required for the New Year to migrate by a single day. On this basis the cycle began c. 1320 B. C.

Differences of opinion have been entertained by various scholars on this point, yielding significant differences in the dates to be derived by the method. Budge commented at the beginning of the century on the insecurity of any specific date for such an ending of a sothic period:

... It must be remembered, as said above, very little confidence is to be placed on any calculation of this kind in attempting to formulate an exact chronology, especially as authorities, both ancient and modern, are not agreed as to the exact date in the second century of our era when the Sothic period ended on which they based their calculations.²⁷

These differences of opinion have been much wider than suggested by Budge. The astronomer Lockyer recognized evidence pointing to a beginning date some four centuries earlier than the now accepted date.²⁸ The ancient astronomer, Theon, seems to have recognized²⁹ an end to a cycle in B. C. 26.

Ingham proposed³⁰ retaining the date 141 A. D. for the *end* of the cycle but considered the beginning to have been in 1312 B. C. rather than 1320. Brugsch and Petrie,³¹ at least at one time, repudiated the scheme on the basis of the uncertainties involved, though Petrie seems to have acquiesced later.

A further factor entering into the problem of establishing such a beginning date is the fact that the ancients used an inexact figure for the length of the solar year in their computations. The year is not exactly 365.25 days in length. It is rather 365.2422 days. If this figure is used in the same calculation by which the period was assigned a length of 1460 years, the length becomes 1507 years.

Should this extra 46 years be added to the date recognized for the end of the period or should the period be given a beginning 47 years earlier? Or, as seems to have been done, should the figures of the ancients be accepted, and the best effort be made to explain how the scheme could be used for dating in spite of these insecurities?

The problem is dropped here for the simple reason that there are much larger reasons for repudiating the validity of the sothic dating scheme. The conflicting data *do* contribute to the insecurity of the method as now used. As will be shown, when satisfactory solutions are provided for the larger problems, settlement of the beginning date is of no consequence. Based on the acceptance of an ending date c. 140 A. D., cycles began in 1320, 2780 and 4240 B. C. Eduard Meyer, an avid proponent of the sothic dating method, proposed the date 4241 B. C. as the earliest fixed date in Egyptian history, supposedly representing the date for the introduction of the sothic calendar.

This date was not at odds with the then accepted date for the beginning of the dynastic period in Egypt back in the 6th and 7th millennium B. C. However, with the introduction of the Carbon-14 dating method, data from the early dynastic period demanded a reduction of the dates to the era 3300-3000 B. C. These dates were shortly thereafter reduced by Scharff to c. 2850 B. C. Such developments gave rise to a further question.

7. Did the Sothic Scheme Begin at the Beginning of a Cycle?

Problems rising from attempts to establish a date for introduction of the wandering calendar and, by inference introduction of the scheme as demanded by the sothic method, have led to a reconsideration of the question as title of this section. It *had* been deduced that the sothic rising referred to in an inscription from the XIIth dynasty³² could not refer to a rising at the *beginning* of a cycle.

The reason was that the inscription provides a date for the "rising" on the 16th day of the 8th month and not on day one of month one. Meyer reasoned that since the XIIth dynasty had been assigned approximate dates between 2000 and 1800 B. C., with the sothic rising necessarily falling between these dates, the scheme could not have

been initiated in 2780 B. C. Hence at least one additional period was theorized as having preceded this date to enable the Egyptians to determine its length by observation.

However, the date 4241 B. C. proposed by Meyer rests on the presumption that the Egyptians were accumulating data during this period with no knowledge of writing. For this and other reasons, Neugebauer repudiated Meyer's date. In this, he was joined by many, perhaps most scholars. Hayes *et al*³³ begin their discussion of early Egyptian chronology with the following statements:

The most significant advance made in the study of ancient Egyptian chronology in recent years is the repudiation by Neugebauer and others of an astronomical origin for the Egyptian civil calendar and, as a corollary, the elimination of the so-called Sothic Cycle as a factor in dating the earliest periods of Egyptian history. It is thus unnecessary to associate the inauguration of the calendar and all that is implied therein, with the beginning of such a cycle in 4241 B. C.

According to the above statements, it was the *astronomical origin* of the calendar, *along with* its application to this early historical period, that was repudiated. This statement reflects the growing recognition that the system need not, or perhaps could not, have been initiated at a date representing the beginning of such a cycle. This shift in thinking gives rise to a still further question.

8. During Which Cycle Was the Scheme Introduced?

Was the scheme introduced within the cycle beginning in 2780 B. C., or could it have been within the cycle beginning in 1320 B. C.? If the latter was the case, this would mean that the scheme did not exist for even one complete sothic period. This view has been entertained, particularly among early scholars who had difficulty in recognizing any satisfactory method for avoiding the difficulties in the scheme, and even more so from the incongruities in the chronological scheme that results from its acceptance.

With a deep insight into the problems involved, Bickerman concluded with excellent reasons that all proposed dates for the introduction of the vague calendar, and by inference the sothic scheme of dating based on this calendar, are *premature*. He wrote:

... All conjectures about the date of the introduction of the *annus vagus* are premature. We can only state that there is evidence of the use of a variable year from the V dynasty on, that the rising of Sirius was observed as early as 1900, and that the celebration of this event was, from the Middle Kingdom, a changeable date in the civil year.³⁴

Bickerman recognized the *crux* of the entire problem though this may not be readily apparent. His statements provide a definition of the most serious mistake that has been made in the use of this scheme for dating purposes. *This is the obvious fact that there is no necessary connection between the use of a 365 day calendar and the introduction of the scheme as it appears in use down in the very late period of Egyptian history.*

When this truth is recognized, it leaves open the very large probability that the *scheme*, as distinguished from the calendar on which the scheme was based, was never in use until significantly later than the date 1320 B. C. Even the probability for such a deduction, standing alone, is sufficient basis for repudiating these dates in dynasty XII as having been "fixed," either astronomically or by any other method. Once this is recognized, the entire problem of ancient

chronology may be relieved of the strictures that resulted from acceptance of the sothic dating method as being valid.

The reasoning leading to such conclusions is quite direct. There is no necessity for presuming that the *scheme* was in use in dynasty V on the basis of the use of a 365 day calendar at that time. Neither is there any necessity for presuming that the sothic rising in dynasty XII, dated to the 16th day of the 8th month, has any relation to this scheme of dating, and by inference no relation to the calendar on which the scheme is based.

A 365 day calendar is still in use today. Yet New Years day does not migrate backward through the seasons. It does not because the calendar is corrected to prevent such changes.

Whether it was this 365 day calendar that was corrected by the ancients, or whether there was an alternate calendar in coincident use which was thus corrected, *and by which the sothic risings were celebrated*, is beside the point. In either case, the dynasty XII inscription provides *no* basis for deducing even an approximate date for the incident. The remaining question is then whether it was the 365 day calendar that was corrected, or whether there was an alternate calendar in coincident use that was corrected, or whether perhaps both were corrected.

9. The Tropical Year of the Egyptians

The concept of the existence of a seasonal or tropical calendar by the Egyptians from earliest times is universally recognized among scholars in this area of investigation.³⁵ Some difference of opinion remains as to when the New Year of such a calendar fell with reference to the seasons. Most certainly it began with the beginning of one of the three seasons of Egypt. These were the Summer or hot season, the Season of Waters or inundation, and the Winter Season or season of growing.

Parker has defended the view that the seasonal year began with the first evidence of a beginning rise of the Nile from the lowest level.³⁶ This occurs with surprising regularity during the second week of August according to the modern calendar. This is the recognized beginning of the Season of Waters.

Parker assumed that it was originally marked by the rising of Sothis as a symbol of the rising Nile. Poole, on the other hand, regarded it as *certain* that the tropical year began with the Winter Season and with the winter solstice. He wrote:

"The Season of Waters" in the ancient nomenclature, plainly shows that the Tropical Year to which that nomenclature was originally applied commenced at the winter solstice, and not at, nor near, either of the equinoxes, or the summer solstice.³⁷

He continued,

... Thus we find that the true period of the commencement of the Season of the Inundation was one month before the autumnal equinox; and consequently, that the Tropical Year anciently in use among the Egyptians commenced at the winter solstice, when all things in Egypt begin anew.³⁸

It is not feasible to define exactly the ancient limits of the Egyptian seasons in terms of present conditions. One reason is that artificial dams have altered the times of rise and fall of the Nile by several days.³⁹ However Poole's approximate correlation of the winter season with the four months following the winter solstice is reasonable. This date could have been readily determined by observation of the day on which the shadows from some tall structure

were longest. There were many such tall structures in Egypt.

Of course, it is not improbable that, for different purposes, a year may have begun at more than one point in the seasons just as is true today. The existence of a tropical calendar with the beginning fixed at the winter solstice does not preclude the use of a second fixed calendar beginning at the beginning of the Season of Waters as proposed by Parker.

10. On the Probable Method of Calendar Correction

The very existence of a tropical calendar in Egypt back into the era of earliest Egyptian history indicates that some method was in use for maintaining the calendar in close approximation with the seasons. The extant inscriptions from the early period provide no information as to *how* this was done. This is not surprising in view of the relative paucity of inscriptive evidence. Absence of such evidence does not controvert existence of such a method of correction. On the other hand, it may point to a simple and relatively automatic method that required no reference to it.

Scripture, likewise, makes no mention of *how* such a correction was made. Yet it is certain that it *was* done since the Hebrew festivals were related both to the month and to the seasons. In later Hebrew history, this was done by addition of an extra lunar month as needed. A similar method was evidently in use in Mesopotamia⁴⁰ and possibly in Greece.⁴¹

Existence of some method of correction in Egypt is indicated by the simple fact that the lives of the Egyptian populace, from earliest times, were linked inseparably with the rise and fall of the Nile level. These phenomena recurred with a surprising degree of regularity and provided the basis for defining the seasonal changes.

It is preposterous to presume that the Egyptians permitted their *practical* calendar to wander in such a manner that the Season of Waters fell in the hot dry season. It is equally preposterous to presume that even down in the late era when references appear indicating a use of such a wandering calendar, that this was the calendar in general use by the populace, even though such had become the civil and official calendar. Bickerman remarked,

In effect, alongside the official year, there was the popular lunar calendar of alternating months of 29 and 30 days which is attested from c. 1900 on. It was *basic in everyday life* and used for cult purposes. At some time (before 235 B. C.) the Egyptians devised a 25 year cycle of 309 months which indicated the dates of the civil calendar on which the lunar months were to begin.⁴² (Emphases added)

That a correlation of the civil calendar with the lunar months was thus used in *late* Egyptian history is very probable since 309 lunar months is a very close equivalent to 25 years of 365 days. If it is recognized that the usage of the *names* of the lunar months continued in a sequence of twelve, this would result in a wandering of a given month *name* backward through the seasons during this interval.

However, if the correlation was in terms of the tropical calendar, an interval of 33 years would be required for the month names to return to a former position.⁴³ This would account for the apparent anomalies that occur between month names and the beginning of the year and of sothic risings.⁴⁴ The possibility, however has not been eliminated that more frequent corrections were made.

11. The Sothic Rising Reference in Dynasty XII

It is the sothic interpretation of this reference that stands as the ultimate basis for the current views on the chronology of Egypt. Without this reference, it is extremely doubtful that such a viewpoint would ever have been devised, and certainly without this reference, there is little reason to suppose that the general outline of ancient chronology as now accepted would have survived the opposing evidence to the present.

The pertinent statements in question are part of a fragment of papyrus inscription found at Kahun Egypt. The particular statements are part of a letter addressed to the priest Papihotep and read as follows:

You ought to know that the Rising of Sothis takes place on the 16th of the 8th month. Announce it to the priests of the town of Sekhem-Usertasen and of Anubis on the mountain and of Suchos . . . and have this letter filed in the temple record.⁴⁵

12. An Attempt to Date the Inscription

Prior to about 1945, scholars conceded that it was not possible to assign a date to this inscription,⁴⁶ since the king, in whose 7th year the inscription is dated, is not named. An attempt was made by Lynn Wood⁴⁷ to surmount this problem by correlating data based on the sothic dating method with a series of lunar data found in another papyrus fragment which seems to be part of the same group of inscriptions. Wood had noted that a later reference to a change of priestly function was dated to the 26th of the month Payni.

Assuming that this dating was in terms of the wandering calendar, and assuming that this practice of priestly change on Payni 26 had been in use from back in the XIIth dynasty, and assuming that the change of priestly function was at the time of a new moon, this date was traced back in time in terms of the vague calendar to determine the dates when the 26th of Payni fell at the time of a new moon.

Since a single lunar datum of this type repeats in periods of 19 solar years and of 25 years of 365 days, fourteen such dates were located between the years 2000 and 1810 B. C., which was the period assigned to dynasty XII.

The problem was to determine which of these dates agreed best with one of the data in the lunar series. A decision was made in favor of the date 1849-1848 B. C. This date was assigned to the 31st year of the unnamed king, who was identified as Sesostri III, and also to the year to which the lunar data belonged.

From this date, the date of the Sothic Rising in the 7th year of the king, could be calculated as 1873-1872 B. C. The corresponding dates for the beginning and end of the dynasty were thus computed as 1991 and 1778 B. C. respectively. These are the so-called "astronomically fixed" dates of dynasty XII.

13. Parker Proposes a Different Date

Five years after the report by Wood, R. A. Parker proposed a *different* date for the series of lunar data.⁴⁸ Since the nature of the series of lunar data was such as to preclude the data belonging to more than *one* date over a period of a millennium or more, Parker recognized that the date proposed by Wood was insecure, in spite of labelling as astronomically fixed. Earlier scholars had expressed a suspicion that one of the data of the lunar series was being misread. Parker began his study with a critical examination of a photostatic copy of the inscription and concluded that the earlier suspicion was correct. One datum *had been* misread.

Since the lunar series could not belong to more than one specific year, and since Wood had not recognized the misreading, a further attempt was made to define this specific year without recourse to the sothic dating scheme. *No acceptable date* was found between the limits assigned to dynasty XII which now met the lunar series as corrected.

Strangely, Parker then reverted to the use of the misread datum and varied the definition for the beginning of a lunar month. Earlier scholars had defined this beginning as the day of the *first* appearance of the new crescent moon. This was in agreement with the Egyptian expression for a new month as "new light." This definition had been adopted by Wood. Parker, however, elected to define the beginning of a new month as the day of the *last* appearance of the old crescent moon. It is thus left to the individual to provide a basis for equating the old crescent with "new light." On the basis of this study, a date of 1813-1812 B. C. was proposed as an alternate date for the year to which the lunar data belonged. The unnamed king is now identified as Amenemhet III rather than Sesostri III.

14. Proposals of Wood and Parker Challenged

In 1972, John Read recognized that neither of the previously proposed dates was soundly based and thus reopened the problem.⁴⁹ Read blistered Parker for presuming to propose a solution to this problem based on the assumption that the misread datum was actually an error on the part of the ancient compiler. He boldly asserted that neither Wood nor Parker had found a correct solution to the lunar data series, and that it was impossible that they could have done so, since neither study was based on this corrected datum.

Read challenged Parker's proposal also from the standpoint that he used an unwarranted definition for the beginning of a lunar month, and on the basis that his solution did not actually meet the demands of this lunar series otherwise. It was pointed out that Parker had used one month of 31 days in arriving at his solution which was not only unwarranted but was impossible astronomically.

15. Subsequent Period Searched by Read

Most certainly there must be a specific year into which all 12 of these lunar data could be fitted. Since neither Wood nor Parker had found a year within the limits ascribed to dynasty XII, Read elected to extend the search into the subsequent period. Not until he reached a date of 1549-1548 B. C. was a year found that met all data in the series. In Read's study, the corrected datum was used and the earlier definition for the beginning of a lunar month recognized.

Since Read saw no possibility of moving dynasty XII forward on the time scale by this 300 years, he proposed that the Kahun *papyri inscriptions* be redated to the era of the early XVIIIth dynasty. Thus he identified the unnamed king as Ahmose I, first king of the dynasty. This raised a new problem. The lunar series was dated to the 31st year of the ruling king. But Manetho had credited Ahmose with only 25 years of reign, and no evidence had been noted for questioning this figure.

16. An Impasse is Reached

Parker was quick to respond⁵⁰ to Read's challenge, pointing out that it was out of the question to redate these inscriptions to the era of dynasty XVIII since there was clear evidence in other fragments of the group indicating a background in dynasty XII. In this rebuttal, Parker defended his use of the misread datum on the basis that the error was

that of the ancient compiler. Parker defended his use of the altered definition for the beginning of the lunar month on the basis that he had previously confirmed other dates by the use of this definition. But had he? Or were his confirmations on the same level of unacceptability as his proposed date for the lunar series?

So what is the situation as far as *any one* having provided a defensible "fixed date" on which a chronology can be solidly constructed? Read claimed a date 300 years too late to meet the demands of the current setting of dynasty XII. But Parker provides excellent reasons why the inscriptions cannot be so dated.

17. Is This Situation a True Impasse?

Is it true that there is no obvious road around this "blind alley" reached by application of the sothic dating method? Have all the possibilities been considered? Or, does the *apparent* impasse point clearly to a third alternative—one that would recognize that the dates for dynasty XII should be moved forward by 300 years *along with* the date representing the year of this series of lunar data?

If this is the case, then the chronology of antiquity should be adjusted to this revision. If such a shift is actually impossible, then the impasse holds. If the adjustment can be done in such a manner as to provide solutions to numerous problems of archaeology, without upsetting any of the established interrelations between ancient peoples, such a reconstruction, alone, is the best possible evidence that this third alternative is the correct solution to the apparent impasse.

There is no difficulty in understanding *why* such a suggestion could not be given serious consideration by any one who accepts as fixed the dates derived by the "approved" sothic dating method. One does not move "fixed dates" any more than one moves fixed mountains. *These dates must be retained*, even if it is necessary to use incredible explanations for the difficulties that result. Once this fixity is accepted, the remaining task of scholars is not to question the *method* but only to try to make the data "fit" regardless of the pathetic nature of the misfit.

Interestingly enough, this third possibility of adjusting Egyptian chronology by 300 years is quite the same as that proposed in the volumes entitled *The Exodus Problem and Its Ramifications*.⁵¹ Such a reconstruction was worked out long before Read made his discovery of a date for the series of lunar data 300 years later than that previously recognized; indeed, this reconstruction was based on totally independent data. The dates assigned⁵² to the beginning and ending of dynasty XII are within a year, that is, 300 years later than those deduced by Wood—namely, 1692-1479 B. C. rather than 1991-1778 B. C.

This is the same chronology that provides the backgrounds for the various incidents of Scripture, which eliminates the very bases for these claims of a multiplicity of historical errors in Scripture. This is the same reconstruction that provides solutions to well over 100 problems of archaeology, many not related to Scripture at all.⁵³ Yet the reconstruction retains the *established* synchronisms of antiquity, as distinguished from the proposals which actually depend on the accepted chronology rather than provide any support for it. Instead of the expected appearance of new problems and anachronisms, there is an elimination of anachronisms and incongruities that characterize the traditional chronological structure.

The *apparent* impasse only emphasizes the general correctness of this third alternative. If one can extend his

thinking beyond the objection that this solution lies *outside* the limits imposed by application of the sothic dating method, then remaining objections are reduced to the level of trivia for which alternate and rational explanations are available. It has been assumed that the combined wisdom of scholars over a century or more could not make a mistake of the magnitude of 300 years. But could they?

If such scholarship could make a mistake of a few hundred million years in assigning the period of man's existence on the earth, what is at all strange about a mistake of 300 years in dating the XIIth dynasty in Egypt? If a mistake of a *multiplicity* of millennia could be made in dating the evidence that clearly belongs to the immediate postdiluvian era of Scripture,⁵⁴ then what is so surprising about an error of a millennium in dating the beginning of the dynastic period? Could it be possible that when scholars accepted the premise that Scripture has *no necessary* dependability in its historical details that they deprived themselves of the one source that could have prevented such errors?

18. Another Look at XIIth Dynasty Inscription

The current interpretation of this sothic rising inscription, on the basis that the data given are in terms of a wandering calendar, cannot be rationally regarded as leading to "fixed dates." This holds true so long as there is at hand an alternate interpretation that leads to elimination of difficulties.

In the face of a necessary recognition of the existence of a tropical calendar in Egypt from earliest times,⁵⁵ an interpretation of this inscription in terms of such a calendar is altogether in order. This follows from the fact that there is *no necessary* relation between the existence of a 365 day calendar and the sothic scheme, as it appears in late Egyptian history.⁵⁶ Recognizing such a starting premise, the months there referred to are *lunar* months, not 30-day months of a vague calendar. This is a reasonable deduction since other data from the same group of inscriptions are clearly lunar months.⁵⁷

Since the sothic rising was on the 16th day of the 8th month, the beginning of the tropical year was 7 months, 16 days (or 222 days) prior to the sothic rising. If then it is possible to date the sothic rising in terms of the modern calendar, it will also be possible to date the beginning of the tropical year at that time in the same manner. If this date agrees with a recognized date for the beginning of the ancient tropical calendar, the starting premise is confirmed. The reasoning is as follows:

The sothic period ending in 140 A. D. falls on July 19 when correlated with the modern calendar. It is then inherent in the definition of a sothic period that the *beginning* of that period also coincided with July 19. This is true irrespective of what length may eventually be assigned to the period. Hence the problem of the exact length of the period can be disregarded. This is also true, whether or not the sothic scheme was in use at the time in question. Hence this question also is not involved in the reasoning. This specific day will also fall on July 19 in terms of any other calendar that was in use at this time, no matter how the day is defined by that calendar. Thus it was July 19 also by the tropical calendar of that day.

Since this tropical calendar had been in continuous use from earliest historical Egypt, it then follows that the sothic rising of the XIIth dynasty inscription was also on July 19. The tropical year then began 222 days earlier, or on December 9. But this is within a few days of the recognized beginning of the tropical year in mid-December and

only two weeks away from the winter solstice, a point which may well have been the original basis for beginning the tropical year. The minor discrepancy can be accounted for on the basis that the year of the sothic rising fell between corrections of the lunar calendar.

By this interpretation, the priest Pepihotep should know about the upcoming sothic rising because it had been occurring on approximately this same date for as far back as sothic risings had been observed. The discrepancy from a fixed date could have been readily calculable mentally. This makes a lot more sense than to assume that his knowledge was based on accumulated data on sothic risings by a wandering calendar over a period of a millennium, or to assume the existence of a series of chronological charts from which such a deduction could be calculated.

19. The Enigma in the Inscription of Una

The inscription of Una of dynasty VI provides potent evidence *against* the accepted interpretation of the sothic rising inscription of dynasty XII.⁵⁸ Una tells how he had gone to a quarry to the south to secure large stones to be used in a ceremonial structure. During the last 17 days of his quarrying, he *hastily* constructed a barge to transport the stone down the Nile. But on reaching Memphis, he found that the Nile level was so low that he had extreme difficulty in unloading the stone. The time was thus obviously at the end of the Season of Waters.

Applying the principle of the vague calendar, a date was assigned to this episode c. 3350 B. C. But with the necessary abbreviation of the dynastic period on the basis of data from the introduction of the Carbon-14 dating method, this date was as early, or even prior to, the date assigned to dynasty I. It was not possible to move the date forward by an entire sothic period to maintain the interpretation since dynasty XII had already been assigned to this later period. To meet the difficulty, it was assumed that Una had made the trip down the Nile *before* the Nile level had raised to a suitable level, namely, in the late summer season.

But this does not make sense. Una tells of his *haste* in building the barge. This leaves us with the question of why Una was in such a hurry to build his barge. Why did he not take his time in building the barge, making the trip down stream a few weeks later when the water was higher? By the altered interpretation, the stated date (month x, day 28) is 30 days before the end of the year and 30 days before the end of the Season of Waters when the Nile level would be subsiding. The problem disappears.

20. "Fixing" the Dates for Dynasty XVIII

A sothic rising is mentioned in an inscription known as Ebers Papyrus.⁵⁹ The inscription is in the form of a series of items, the first three of which read as follows:

New Years Day	month 11, day 9	Sothic Rising
Tekhi Thoth	month 12, day 9	
Menkhet	month 1, day 9	

Then follows the names of the other nine months, each with the number of the month and "day 9" added. The inscription is dated on the back to the 9th year of a king whose name has been obscured. After various suggested readings, the "best that could be done" was to read it Zeserkare, the throne name of Amenhotep I, second king of dynasty XVIII.

Other than the uncertainty in the reading of the name, the inscription is enigmatic in that it gives Menkhet as month 1, when by the sothic dating method, it should be Thoth. Assuming that the compiler meant Thoth when he

wrote Menkhet, and inserting the five intercalary days between month 12 and month 1 as demanded by the method, but which the compiler forgot to include, a date for the 9th year of Amenhotep I was calculated on the basis of the vague calendar. From this, a date for the beginning of the dynasty was "astronomically fixed" to 1580 B. C. MacNaughton quotes Weill on the ambiguity of this inscription.

The explanation without doubt difficult enough, as we are going to see, has not been satisfactorily attained up to 1920. During the 50 years which preceded, the innumerable interpreters of the document see themselves as at the foot of an insurmountable wall.⁵⁹

If anything meriting consideration has appeared since 1920, it has escaped my attention. Can dates be truly "fixed" from such source materials?

As an alternate hypothesis, it is suggested that the months are not lunar but 30 day months since they are all the same length. Since there are no intercalary days, the inscription belongs to the early Hyksos period when a 360-day year was in use and prior to the correction to 365 days credited to the Hyksos king Aseth.⁶⁰

Brugsch-Bey recognized⁶¹ that the Hyksos invasion occurred at a point in the Turin list of XIIIth dynasty rulers represented by name No. 26. To this same era belong the names Kah-seshesh-re (No. 22) and Kha-hotep-re (No. 27), one of which may be that of the obscured name on the inscription, now read Zeser-ka-re.⁶² The order of syllables in Egyptian names has no necessary significance.⁶³

The sothic rising then may be also dated to July 19 by the modern calendar. The apparent dislocation of the months is explained on the assumption that the Hyksos had failed to correct their calendar to meet the Egyptian schedule for such correction.

21. Sothic Rising Reference from Tomb of Senmut

A further reference to a sothis rising was found⁶⁴ in the tomb of Senmut who served under Hatshepsut of dynasty XVIII. The sothic rising had been dated by Borchardt⁶⁵ to the era 1465-1462 B. C. to correspond with the date month xi, day 28 of the inscription. Borchardt defended a date 1490 B. C. for the coronation of Thutmose III, which date was accepted by Read.⁶⁶ Read did not explain what was to be done with the date May 3, 1501 B. C. supposedly astronomically fixed⁶⁷ for the accession of Thutmose III. Can two dates for the same occasion both be astronomically fixed?

I propose that this sothic rising should also be interpreted in terms of a lunar calendar corrected, as noted above, to the seasons. Hence this rising occurred also on July 19 of the modern calendar. The beginning of that tropical year was then 30 days later, or on August 18. But this is the approximate date recognized for the *beginning* of the Season of Waters, and not at its *end* as was found to hold for the era of dynasty XII.

Parker, then, seems to be quite correct in deducing that the seasonal year of dynasty XVIII began with the *beginning* of the Season of Waters. However, it was not marked by a sothic rising as he proposed. This had occurred a month earlier. The explanation for this difference in the beginning of the tropical year may be accomplished by one of two suppositions. Either there were two calendars in use, corrected to the seasons but differing in their beginnings by a full season, or there had been a shift of one full season during the interval between dynasties XII and XVIII. The former explanation would be analogous to the modern use of one fiscal year beginning on January 1, and another on

July 1. For the present discussion, it is of no consequence which of these is eventually substantiated.

22. Lunar Data in the Reign of Thutmose III

There are two lunar data⁶⁸ from this reign which must be considered in any proposed establishment of a date for the beginning of the reign of Thutmose III. However, lunar data repeat at intervals of 25 years of 365 days, or at intervals of 19 solar years. Hence such data have no genuine value in corroborating such a shaky date as that provided by the Ebers Papyrus. As to be expected, Read⁶⁹ had no difficulty in finding alternate lunar dates in this reign to fit a date 1490 B. C. differing by 11 years from the earlier supposedly astronomically fixed date 1501 B. C.

This earlier study must also have considered these lunar data since the year of the king's reign is not given in the inscription. This date is 550 years earlier (plus or minus a year or two) from that proposed in my reconstruction.⁷⁰ Again, my date is based on totally different and independent data. The figure 550 is divisible by 25 and the figure 551 is divisible by 19. Hence there should be no difficulty in also finding dates within one of these years which meet the demands of the lunar data.

23. Sothic Rising in Reign of Rameses III

A sothic rising reference occurs⁷¹ as the first item in a calendar of events found in the temple of Rameses III. This king is currently dated to c. 1200 B. C. By the reconstruction, the date is c. 725 B. C. The *name* of the month is not given. It is only stated that the sothic rising occurred on the first day of the first month. The *name* to be assigned to the month has been a matter of difference of opinion with no satisfactory answer. Brugsch-Bey⁷² thought the month should be Thoth, but by the sothic dating method, a sothic rising occurs on Thoth 1 *only* at the beginning or end of a sothic period. Certainly Rameses III cannot be so dated by any chronology. Could it be that Thoth 1, in those days, was recognized by some as the first day of every year?

The inscription gives the feast of Hathor as celebrated on day one of month iv. But Hathor was the *third* month at a later time. The calendar does not seem to be interpretable in terms of a tropical calendar beginning with either the beginning or end of the Season of Waters.

I have a strong suspicion that prior to a very late date in Egyptian history, the names of the months, as distinguished from their numerical positions in the year, migrated not alone with the vague calendar, but also with a lunar calendar corrected to the season. The names would then wander backward through the seasons in a cycle of 33 years.⁷³

The use of such a system might explain the apparent anomalies in the Egyptian sources which indicate a variation of name for the first month, yet not in agreement with the sothic dating method. Examples⁷⁴ of such might be the inscription of Unas and the flood inscription of Tibi 12 in the reign of Osorkon II. Even dating of the Ebers Papyrus may ultimately be solved satisfactorily in terms of such an arrangement.

It is not until the late 3rd century B. C., that a reference appears which indicated clearly the use of a vague calendar as related to sothic risings. Such a reference⁷⁵ occurs in the *Decree of Canopus* by Ptolemy III, Euergetes I (235 B. C.). The document contains a statement to the effect that this scheme had been in use long enough for festivals originally designed to fall in the summer months to have migrated back into the winter season. A period of some 400 years is adequate time for this to have occurred, making

unnecessary an interpretation of the inscription of Rameses III in terms of the sothic dating method.

24. Conclusion

It should be noted carefully that no claim is made for having *proved* that the proposed reconstruction of the chronology of antiquity is beyond the need of modification. It is *believed*, on the basis of overwhelming evidence, that dynasty XII belongs to an era 300 years later than that now recognized. Once this evidence was recognized, the problem was one of adjusting the chronologies of Egypt and of other contemporary peoples of antiquity to meet these later dates.

In spite of the apparent impossibility of making such a gross alteration, short of reducing to a shambles the interrelations between ancient peoples, such a reconstruction has been proposed. Evidence for the general correctness of this *reconstruction* is found in the solutions to numerous problems, both related and unrelated to Scripture, yet without disturbing any established synchronism. Those that are repudiated are shown actually to be anachronisms.⁷⁶

All of this is a specific application of the unifying principle known as Ockham's razor. That principle, sometimes called the principle of parsimony, is recognized, at least tacitly, as an established tool of evaluation by every investigator in the field of archaeology, or of any other science, who is worthy of the designation of a scholar.

According to this principle, as it is commonly stated, entities, and in particular explanations, are not multiplied needlessly. It follows, then that when a choice has to be made among several proposed explanations, the one which deals with the most data should be chosen. The explanation proposed here, that the conventional Egyptian chronology needs correction, deals with a multitude of data, from both Scripture and archaeology.

Thus it is possible to have a proper background for the unique incidents of Scripture without having to compromise any significant details of its historical statements. Then claims of error in Scripture can be met head-on; and it is found that the error is not in Scripture, but rather in the conventional interpretations of archaeology and chronology.

Reference

- ¹Courville, Donovan A. 1971. The exodus problem and its ramifications. Crest Challenge Books, Box 993, Loma Linda, California 92354. This work provides a rehearsal of a mass of controverting evidence. Some of the material has been summarized in the C. R. S. *Quarterly*, in the issues of June, 1974 and March, 1975.
- ²Filmer, W. E. 1966. The chronology of the reign of Herod the Great, *Journal of Theological Studies*, New Series, XVII (2): 283-298. Cited by Maier, Paul L., 1968. Sejanus, Pilate, and the date of the Crucifixion, *Church History*, xxxvii (1): 3-13. Actually, there could even be three possibilities. See Filmer's remarks about the eclipse on 29 December, 1 B. C., on page 284 of his article.
- ³Newton, R. R. 1973-1974. The authenticity of Ptolemy's parallax data, parts I and II; and The authenticity of Ptolemy's eclipse and star data, *Quarterly Journal of the Royal Astronomical Society*, 14 (4): 367-388; 15 (1): 7-27; and 15 (2): 107-121.
- ⁴Personal communication with Lynn Wood (Reference 22) to confirm notes on his lecture at Loma Linda University in which he proposed correlation of this eclipse record with a partial eclipse in 791 B. C. in defense in part of his dating of the Exodus in 1612 B. C.
- ⁵Rowley, H. H. 1950. From Joseph to Joshua. Oxford University Press, p. 10, note 2. This cited Mahler, 1916, Handbuch der jüdischen chronologie.
- ⁶*Ibid.* Indeed, Luke says, in the Greek, that the sun was eclipsed; and the New English Bible has translated that literally. But there cannot have been an eclipse of the Sun in the astronomical sense.

For the time was the Passover; the Moon was full, and on the wrong side of the Earth to cause an eclipse of the Sun. Luke must have understood "eclipsed" as meaning simply "hidden" or "obscured".

⁷Brugsch-Bey, Henry 1881. Egypt under the Pharaohs. London. II, p. 227. Another translation reads: "... before heaven devoured the moon". The differences in translation emphasize the obscurity of the meaning. For difficulties in the interpretation of this inscription, see Albright, New light from Egypt on the chronology and history of Israel and Judah, *Bulletin of the American Schools of Oriental Research*, No. 130, p. 4f.

Note that there could not be any eclipse on the 25th of a lunar month. Indeed, the description does not seem to be that of an eclipse. For if the heaven was obscured, by dust or clouds for instance, it would not have been known that there was an eclipse. On the other hand, an eclipse does not, in itself, obscure the heaven; the stars are still seen.

⁸Budge, E. Wallace 1904. Books on Egypt and Chaldea. London. IX, p. 217.

⁹MacNaughton, Duncan 1932. A scheme of Egyptian chronology. London, p. 354.

¹⁰*Ibid.*, p. 352.

¹¹See subsequent sections.

¹²See sections 12f.

¹³See note 1.

¹⁴This point is not granted by the writer. The notion has also been questioned by others. See Budge, *Op. cit.*, ix, p. 148, for example.

¹⁵See Sections 5 and 6.

¹⁶See Sections 12 ff for examples of failures in applications of the sothic method.

¹⁷See Section 8 for the basis for this statement.

¹⁸See Sections 18 and 21.

¹⁹See Section 9 on the existence of such an alternate calendar.

²⁰See note 18.

²¹See note 1.

²²Wood, Lynn 1945. The Kahun papyrus and the date of the twelfth dynasty (with chart), *Bulletin of the American Schools of Oriental Research*, No. 99, p. 7.

²³Poole, R. S. 1851. The chronology of ancient Egypt. London, pp. 30 and 31.

²⁴MacNaughton, *Op. cit.*, pp. 28 and 31.

²⁵MacNaughton's theoretical views are not acceptable since his starting premise was clearly in error.

²⁶Newton, R. R. 1974. Two uses of astronomy, *Philosophical Transactions of the Royal Society of London*, Series A, 276 (1257): 99-116. See also Newton, R. R. 1974. The application of ancient astronomy to the study of time, *Endeavour*, XXXIII (118): 34-39.

²⁷Budge, *Op. cit.*, IX, p. 151. (Reference 8)

²⁸*Ibid.*, p. 149, citing Lockyer, Norman 1894. Dawn of astronomy, p. 202.

²⁹Odom, Leo. 1965. Vittius Valens and the planetary week, *Andrews University Seminary Studies* III, p. 110.

³⁰Ingham, M. F. 1969. Length of the sothic cycle, *Journal of Egyptian Archaeology*, 55, pp. 36ff.

³¹Cited by MacNaughton, *Op. cit.*, p. 10.

³²See Section 10 for wording of the pertinent statements.

³³Hayes, W. B., M. B. Rowton, and F. H. Stubbings 1962. Chronology: Egypt; Western Asia; Aegean Bronze Age. Cambridge University Press, p. 3.

³⁴Bickerman, E. J. 1968. Chronology of the ancient world. Great Britain, Thames and Hudson, p. 42.

³⁵Parker, R. A. 1974. Ancient Egyptian astronomy, *Philosophical Transactions of the Royal Society of London*, Series A, 276 (1257): 51-65.

³⁶Parker may well be correct here for the situation in Dynasty XVIII. See Section 21.

³⁷Poole, *Op. cit.*, p. 4. (Reference 23)

³⁸*Ibid.*, p. 5.

³⁹See reference 37.

⁴⁰Bickerman, *Op. cit.*, p. 22. (Reference 34)

⁴¹*Ibid.*, p. 29.

⁴²*Ibid.*, p. 41.

⁴³Actually 408 lunar months are equivalent to 32.988 years. During this time, 12 extra months would have been inserted, so that the names would return to the position in the seasons which they had 33 years earlier.

⁴⁴See Section 23, paragraph 3.

⁴⁵MacNaughton, *Op. cit.*, p. 146. (Reference 9)

⁴⁶Wood, *Op. cit.*, p. 5.

⁴⁷*Ibid.*

⁴⁸Read, John 1972. Early eighteenth dynasty chronology, *Journal of Near Eastern Studies*, 29, p. 2. Read cites Parker, R. A. Studies

in ancient oriental civilizations 26, *Journal of Near Eastern Studies*, p. 64.

⁴⁹Read, *Op. cit.*, p. 4.

⁵⁰Parker, R. A. 1970. The beginning of the lunar month in ancient Egypt, *Journal of Near Eastern Studies*, 29, pp. 217ff.

⁵¹See Note 1.

⁵²Courville, *Op. cit.*, I, chart p. 223. (Reference 1)

⁵³Prominent in this latter category are: (1) elimination of the incredible time squeeze for the period between dynasties XII and XVIII, (2) restoration of the proper time order of the same events in Egyptian and Greek histories, (3) identification of the incident of which the 400th anniversary was noted by Rameses II. See Courville, *Op. cit.*, I, p. 123; II, p. 274, and I, p. 293 respectively. For numerous other solutions, consult the index at the end of II under Anachronisms.

⁵⁴Courville, *Op. cit.*, chapters VII and VIII.

⁵⁵See reference 35.

⁵⁶See Section 8.

⁵⁷For example, the lunar series used as the basis for attempts to provide a fixed date.

⁵⁸Petrie, F. 1925. A history of Egypt. London. I, p. 95; and by Budge, *Op. cit.*, IX, p. 152.

⁵⁹This inscription is reproduced and discussed by MacNaughton, *Op. cit.*, pp. 194f. (Reference 9)

⁶⁰Waddell, W. G. 1956. Manetho. (translation) Cambridge, Massachusetts, Harvard University Press and London, William Heinemann, Ltd, p. 241.

⁶¹Brugsch-Bey, *Op. cit.*, II, p. 211. (Reference 7)

⁶²Courville, *Op. cit.*, I, p. 126 (Table VI). (Reference 1)

⁶³*Ibid.*, p. 155.

⁶⁴MacNaughton, *Op. cit.*, p. 211.

⁶⁵Cited by Read, *Op. cit.*, p. 6. (Reference 48)

⁶⁶*Ibid.*

⁶⁷Breasted, James Henry 1954. (Reprint) A history of Egypt. Charles Scribner's Sons, New York. Table, p. 599. Starred dates are "astronomically fixed".

⁶⁸Read, *Op. cit.*, p. 6.

⁶⁹*Ibid.*, p. 7.

⁷⁰Courville, *Op. cit.*, I, chart, p. 268.

⁷¹MacNaughton, *Op. cit.*, pp. 242ff, gives a reproduction of this calendar of events and a discussion of its problems. (Reference 9)

⁷²Cited by MacNaughton, *Op. cit.*, p. 242.

⁷³See note 43.

⁷⁴Petrie, *Op. cit.*, III, p. 251. (Reference 58)

⁷⁵This inscription is reproduced in part by MacNaughton, *Op. cit.*, pp. 297f; and in total by Budge, *Op. cit.*, III, chapter VI. (Reference 8)

⁷⁶The more notable of these are the popular identification of Shishak of Scripture with Sheshonk of dynasty XXII and the backgrounds popularly assigned to the unique incidents of Scripture.

Comments by Editor Armstrong

May I propose a few questions, the answers to which, if they can be found, might throw additional light onto the matter of Egyptian chronology?

Is it possible that originally the "rising of Sothis" referred primarily to the rising of the Nile in flood, and only incidentally to the appearance of Sirius about the same time? The rising of the Nile was a vital matter to the Egyptians; and Heliodorus and other writers have mentioned a festival to celebrate it.

Would the letter to Papihotep not make better sense in this way, if it referred to a festival; for what sense would there be in telling someone to observe an astronomical event when it was already known when it would happen? Is it possible even that the star was named after the flooding, not vice versa?

It is reported that Bruce found that, in parts of Abyssinia, the Nile was called by a name related to "dog" or "dog

star"; and Pliny wrote that at one place the Nile was called "Siris", a name which sounds rather like "Sirius".

Is it possible that the word "Sothis", which, I believe, is found only in the Greek, or in Latin taken from Greek, has to do with the Greek word for "save"? Such would not be too strong language, in view of the terms used in the hymn to the Nile by Ennana, which still exists on papyrus.

Further, Diodorus Siculus mentioned, "... the time of the rising of Sirius, which is the season when the river is usually at flood..." It could have been, then, that later writers, who were interested in astronomy, not agriculture, shifted their interest from the river to the star.

If the answer to the above questions is "yes", that means that while the "rising" is still known to have occurred about midsummer, it could hardly be called astronomically fixed. Moreover, there seems to be some evidence that there were three or so festivals connected with the flooding: one in anticipation and one in retrospect, besides one at flood time. (See Hardwicke, D. Rawnsley 1892. Notes for the Nile. Heinemann and Balestier, London, pp. 223-238.)

Also, is it possible that the "Egyptian year" of 365 days was just an astronomers' year, and was never used much for any other purposes, just as the Julian arrangement is still used for some astronomical purposes?

It appears that the Egyptian year was so used by astronomers for centuries after the times which are of concern to Dr. Courville, and when it is certain that the ordinary way of reckoning time was something else. If so, one would not expect to find it used much in inscriptions or records.

The Canopus decree, which was prepared for astronomical purposes presumably with the advice of astronomers, would be an exception. Josephus' writings, in one place, seem to say that the Hebrew lunar calendar corresponds to that used in Egypt, although the passage may be a little ambiguous.

Distinct references to a year of 365 days seem to be late, and by Greek writers. (Censorinus and such writers were Greek in outlook.) Geminus seemed to take the lunar one as a natural definition of "month", although he noted other systems.

Again, it is known that the Hebrews seem to have counted two different beginnings of the year. Moreover, Censorinus stated that at one time the Egyptians used seasons as if they were years. So maybe someone should consider whether, in some cases, the third month, say, might mean "of the season".

Could it be that, in the Egyptian lunar calendar, there was an appearance of months of 30 days because sometimes one day would be counted twice: as the 30th day of a certain month and the first day of the next month? That might have seemed as natural as calling a year the last year of a certain king and the first year of his successor. The effect would be to introduce five and a fraction "dummy" days. If writings and inscriptions which give dates are in terms of a lunar calendar, it is not likely that they will be very useful with regard to chronology.

Incidentally, for some interesting general discussion of this matter, see Velikovsky, I. 1973. Astronomy and chronology, *Pensée*, 3 (2): 38-49.

DEPOSITION OF CALCIUM CARBONATE IN A LABORATORY SITUATION

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R. D. JONSONBAUGH,* AND D. L. PIERCE*

This account is an interim report. The purpose of the work is to investigate experimentally, under laboratory conditions, the precipitation of calcium carbonate dissolved in water. Such information is important to interpretations of dripstone formations, in caves and elsewhere, with regard to the age of the formations.

Experimental Rig

Figure 1 shows the experimental rig used in dissolution and later precipitation of calcium carbonate.

Tap water and carbon dioxide are brought into a box containing limestone chips. A magnetic stirrer is used to circulate the water and gas throughout the solution box (6" X 6" X 6" plastic). An exit tube near the top of this box is used to drain off the carbonate laden water into a precipitation box (6" X 6" X 6" plastic). Holes in the bottom of the precipitation box are filled with strings as shown. The water drips downward along the strings depositing calcium carbonate. A fan is used to blow air on the strings.

Humidity

The atmosphere around the strings is fairly humid since water is kept in the bucket on which the precipitation box is supported. Also the general atmospheric conditions in the Greenville area are rather humid so that very little evaporation takes place as the water flows down the strings. Also the drip rate is rapid enough to prevent extensive evaporation.

String Preparation

It is necessary to treat the strings used in the precipitation box so that they are similar chemically to material found on the roof of caves. Most commercial string is coated with materials to prevent deterioration. String coatings would resist any chemical action such as precipitation and is not suitable to use as is.

Lengths of string are steamed in glacial acetic acid for 20 minutes. The string is then placed in a flask containing powdered limestone and water. CO₂ is run through this mixture. The strings become impregnated with particles of CaCO₃ by this action.

Qualitative Solution Test

Early in the research program it was decided to determine how certain solutions under identical conditions were capable of dissolving limestone. Chunks of limestone were exposed to the following solutions for 12 hours:

1. tap water + CO₂
2. tap water + CO₂ + 5% NaCl
3. tap water + CO₂ + 1% acetic acid

The following amounts of CaCO₃ were dissolved by the test solutions:

1. 0.1040 g/100 ml of H₂O
2. 0.5393 g/100 ml of H₂O
3. 0.4019 g/100 ml of H₂O

Solution 1 can be considered similar to normal surface water that has percolated through the soil to a limestone layer. Solution 2 is a postulate type of Flood water high in NaCl that would have receded off the earth through recent-

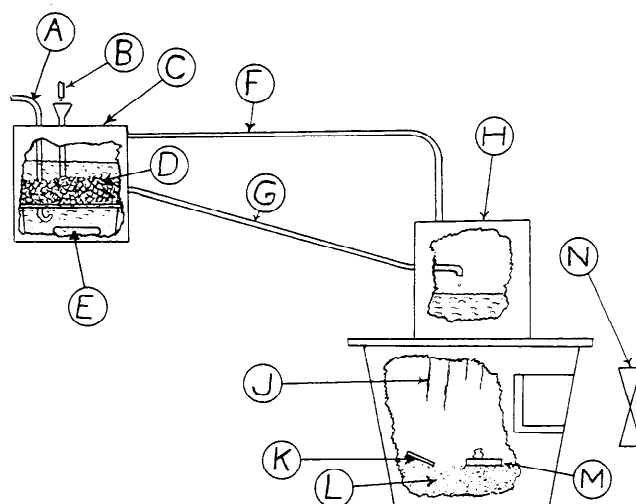


Figure 1. This shows the essentials of the arrangement of the experiment on the deposition of dripstone. The letters indicate the various parts or functions, as follows: A, carbon dioxide input; B, water input; C, rock box; D, limestone rocks; E, magnetic stirrer bar; F, carbon dioxide hose; G, hose for carbon dioxide, water, and dissolved limestone; H, string, or precipitation box; I, strings; J, glass plates; L, sand; M, rock (resting on a slab); N, fan.

ly consolidated limestone. Solution 3 is another postulated type of Flood water high in humic acid because of the decay of many living organisms killed by the Flood waters and collected in one place above recently consolidated limestone.

Quantitative Tests

A 700 hour test was conducted on the deposition of dissolved limestone from a supposed natural rain water solution. The results of this run are shown in Table 1.

Table I. The deposition of limestone from a solution intended to simulate that formed by natural rain water.

String	Length (cm)	Weight of deposited CaCO ₃ (g)	Deposition per cm of string
1	15.2	0.1725	0.01135
2	38.1	0.1975	0.005184
3	20.5	0.01510	0.0007365
4	14.4	0.4132	0.02871
5	17.1	0.1259	0.007362
6	9.9	0.1724	0.01741
7	17.8	0.2001	0.01124
8	16.3	0.1178	0.007224
9	7.2	0.1183	0.01643
10	10.4	0.2634	0.02533
		average:	average:
		0.17964 g	0.0130979 g per cm

*All of the authors are at Bob Jones University, Greenville, South Carolina 29614.

Table II. The deposition of limestone from water containing dissolved CO₂ and 5% NaCl.

String	Length (cm)	Weight of deposited CaCO ₃ (g)	Deposition per cm of string
1	14.0	0.3727	0.02662
2	14.6	0.3612	0.02474
3	16.3	0.4311	0.02645
4	20.8	0.6466	0.03109
5	9.2	0.2659	0.02890
6	8.9	0.2336	0.02625
7	17.8	0.4215	0.02368
8	9.4	0.3423	0.03641
9	22.6	0.4707	0.02083
10	11.8	0.2863	0.02426
11	15.0	0.3388	0.02259
12	15.1	0.2847	0.01885
		average:	average:
		0.3713 g	0.02589 g per cm

Considering a density of deposited calcite of 2.70 g/cm³ this corresponds to a volume of deposition of 0.83 cm³ of calcite/year.

A 500 hour test was conducted on the deposition of dissolved limestone from a solution of tap water, CO₂, and 5% NaCl. The results of this run are shown in Table 2.

This corresponds to a volume deposition of 2.41 cm³ of calcite/year. A total of 209 liters of saline solution were used in this test. The total amount of deposited CaCO₃ on the strings was 0.214 g/l of solution. CaCO₃ deposits all along the experimental system in the plastic box, outside the plastic box, and below the plastic box. Colloidal particles of clay often formed as ooze-like mud in caves was found in abundance in and under the experimental rig. The equipment is shut down every 100 hours to allow the strings to dry.

In the test where the saline solution was used, the strings were washed several times to insure the removal of any encrusted salt. The strings were always dried completely before weighing.

Chemical Analysis of Solutions

The solutions were analyzed periodically in the solution and string boxes to determine how much limestone was actually being dissolved. The method employed was a pH end point titration.¹ The following results were obtained in the experiment using tap water plus CO₂, as shown in Tables 3 and 4.

Tables III, IV, and V. The results of analyses of the solutions in the solution box and the string box. The concentrations of HCO₃, CO₂, and CaCO₃ are given in mg/l. Table III gives the results of tests on the solution in the string box, Table IV on the solution in the solution, or rock, box, and Table V more results from the string box.

TABLE III

pH	HCO ₃	CO ₂	CaCO ₃
6.10	671	1108	550
6.15	729	826	598
6.35	746	553	612

TABLE IV

pH	HCO ₃	CO ₂	CaCO ₃
5.9	672	1354	551
5.9	704	1418	577

TABLE V

pH	HCO ₃	CO ₂	CaCO ₃
6.25	824	742	676
6.25	918	826	753
6.35	951	680	780

Conclusions

As can be seen by the experimental results, massive precipitation of CaCO₃ is possible under laboratory conditions.

Several runs need to be made under similar conditions to verify results.

The data from the saline water experiment is more reliable than that from the tap water experiment. The latter was the first successful run, and there were still some "bugs" in the equipment. Several students were involved in the work, which consequently had to be started and stopped a number of times. The experiment with the saline water was conducted by one person and was not interrupted by any malfunctioning of the equipment.

We believe that it has been shown that the formation of dripstone can be investigated in the laboratory. More work needs to be done to investigate the effects of the several variables which are involved.

This work was supported, in part, by a grant from the Creation Research Society.

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EARLY STEPS IN FORMATION OF CREATION RESEARCH SOCIETY

WALTER E. LAMMERTS*

The American Scientific Affiliation (A. S. A.) was formed at a meeting held September 2-5, 1941. The first annual convention was held in 1946. When I was asked to join by Alton F. Everest in 1944, he assured me that the stance of the society would be anti-evolutionary.

This position is clearly evident in the first book published by A. S. A. entitled, *Modern Science and Christian Faith*. The chapter on "Biology and Christian Faith" written by Dr. William J. Tinkle and me presented many genetic reasons for not accepting any sort of "evolutionary" explanation for the origin of species.

By 1951 the A. S. A. had over 220 members, but along with this growth theistic evolutionists somehow joined, since the statement of belief was far too loosely drawn. By 1963 such men as Bernard Ramm, Richard Bube, Walter R. Hearn, David O. Moberg, William F. Tanner, J. Lawrence Kulp, and J. Frank Cassel dominated the thinking and editorial policy.

Yet by the time of publication of the A. S. A. directory many committed creationists were still members. These included Arthur Custance, R. Laird Harris, John R. Howitt, John W. Klotz, Frank L. Marsh, Henry M. Morris, William J. Tinkle, and Wilbert H. Rusch, Sr.

Increasingly dissatisfied with the theistic evolutionary viewpoint of the A. S. A., I had begun to correspond with a "Team of Ten", who were dedicated creationists. These were Henry M. Morris, William J. Tinkle, Frank Marsh, John J. Grebe, John W. Klotz, Wilbert H. Rusch, Sr., Duane Gish, R. Laird Harris, and Edwin Monsma.

At a meeting of the A. S. A. with the Evangelical Theological Society held at Asbury College in Wilmore, Kentucky

from June 19-21, 1963 several of the "Team of Ten" presented papers. I decided to go to this meeting also. At that meeting the first draft of the present Creation Research Society (C. R. S.) statement of belief was made.

As I recall William Tinkle, Henry Morris, Wilbert H. Rusch, Sr., Frank Marsh, R. Laird Harris, and John Grebe were at this meeting. Only Tinkle, Rusch, and I were able to drive with John Grebe to his home in Midland, Michigan, where we were joined by Duane Gish, David Warriner, John N. Moore, Frank Marsh, Karl Linsenmann, and John Klotz. The first draft of the statement of belief was then "tightened up" to the present form.

The statement has remained unchanged, and has served very well to keep out theistic evolutionists and others who might like to sabotage the C. R. S. position as was done with the A. S. A.

In 1965 I appointed Dr. Thomas Barnes as chairman of the biology textbook committee. This book stresses the viewpoint of an original creation, and design in nature as the explanation of the many interesting facts of biological science. Barnes and his committee worked diligently on the book project with the result that Zondervan Publishing House published the first edition entitled, *Biology: A Search for Order in Complexity* in 1970. Dr. John N. Moore deserves special mention for his splendid coordination work between Zondervan and the committee. He has also been managing editor of the *Creation Research Society Quarterly* since the middle of the second year of publication in 1965.

Two unwritten concepts are held by C. R. S., namely that the universe and the earth are young in age, that is thousands rather than millions of years old, and that many events catastrophic in nature, though local in extent, occurred subsequent to the great flood of Noah's time.

*Walter E. Lammerts, Ph.D., was the first president of the Creation Research Society.

PANORAMA OF SCIENCE

Mechanical Design of Trees

The July, 1975 issue of *Scientific American* contained an interesting article¹ on the mechanical design of trees. The author, T. A. McMahon, stated at the onset, "Usually, of course, there is a single most important design principle both in nature and in engineering." He pointed out that the growth of trees is largely controlled by auxins produced in apical plant tissues.

As a result, in spring, cambial activity starts first in the twigs and progresses down the stem. Differences in auxin concentrations cause trees to grow toward the light, or cause bent trees to grow straight.

McMahon developed the thesis, based on beams of the same cross-sectional shape, modulus of elasticity, and specific gravity, that the diameter of trees will vary with height raised to the 3/2 power, that is the length times the square root of the length.

His study of numerous species indicated that on the average this was true, although he noted that the mean height trees obtain is only about 25% of that they could obtain and still not buckle. That means trees are designed, with regard to buckling, with a safety factor of about four.

Foresters have already recognized that the specific gravity of trees varies with distance from the pith and height up

the stem, and recognized that bole form is quite variable; but McMahon may have quantified a design principle which has general application.

Trees which grow in dense stands tend to be more cylindrical than those in the open field. Those in the field develop more taper allowing them to withstand the greater wind stresses to which they are exposed. McMahon has reasoned that the wood rays are affected by such stresses, and in reaction more auxin moves to areas under stress, resulting in more growth in those areas.

A scientist noted years ago that the knees of cypress trees provide just the type of mechanical support an engineer would design to support a tree in a swamp. Truly, man continues to be amazed at the skills of the greatest engineer, the Creator of all.

—Contributed by Harry V. Wiant, Jr.

Comments on Manipulation of Genes

Man has been fascinated by genetic manipulation from the dawn of civilization, as illustrated by the selection of dozens of breeds of purebred dogs, cats, horses and cattle, not to mention favorite varieties of flowering plants and food crops. Such experimentation is the basis of the trad-

itional definition of a species, as those organisms that will normally cross with other organisms to give fertile progeny.

With the acceptance of the concept of the gene, geneticists assigned bad traits to "bad genes", and good traits to "good genes"; partly by neglect, and partly by design, varieties of plants and animals that carried undesirable genes were replaced by those which seemed to have superior genetic qualities. After a few decades of this type of genetic management, serious problems developed with the highly inbred lines of plants and animals which had originally been picked for their superior genes.

Changes in the environment, including climate, pests, and disease agents made bad genes out of good genes, in terms of inability of the inbred lines to cope with variability of the environment. With brilliant hindsight, geneticists are racing to retrieve disappearing wild strains of important species of plants and animals with their precious genetic traits that confer "hybrid vigor" to strains that are losing the battle with a specific environment.*

Knowledge of genetic control of an organism's developmental pattern and physiology is still rudimentary, being largely confined to observations made on single-celled microorganisms that have only a single uncoated chromosome with as few as three genes. The highly-structured chromosomes of mammalian cells, in contrast, may contain tens of thousands of genes which are packaged in layers of various types of protein, each of which seems to have an important, although poorly understood, role in genetic mechanisms.

Complex though mammalian chromosomes may be, they share a common property with microbial chromosomes, in that they comprise the basic genetic organelles of the cell.

In human reproduction, the fertilized egg contains a set of 23 chromosomes from the male (haploid number of chromosomes) paired with the set of 23 chromosomes of the egg; as the egg undergoes sequential divisions to produce the developing embryo, each of the somatic cells is provided with a true copy of each of the 46 chromosomes (the diploid number of chromosomes). Adult tissue cells sometimes copy the 46 chromosomes as a preliminary step toward cell division, but fail to complete division, giving a cell with the tetraploid number of chromosomes; these in turn may give rise in the same way to a cell with the tetraploid number of chromosomes; these in turn, may be copied without cell division, to produce a cell with the octaploid set of chromosomes.

As long as true copies of each of the 46 diploid chromosomes are being made, without extra copies of one or more chromosomes, the cell doesn't seem to suffer from this polyploidy. Serious genetic defects appear, however, when the cell is induced to change the characteristic size, shape, structure, or balance of chromosomes in the diploid set.

Some of the more dramatic changes in chromosome appearance are found in cells that have been transformed to neoplastic or "cancerous" cells: for example, leukemia cells may show a reduction of the chromosome number from the normal 46 to 37, while at the other extreme, some cancer cells may contain thousands of chromosomes, including abnormal forms.

When neoplastically transformed mammalian cells were first studied in tissue cell culture they seemed the answer to many biological problems, because transformed cells, unlike untransformed cells, grew readily and indefinitely in easily prepared growth medium. Transformed cells from many kinds of tissues were isolated and used to start clonal cell lines in which all the cells were nearly identical, which was a virtue in biochemical experimentation such as testing anti-cancer drugs.

Transformed cells became very popular with virologists, also, for many cell lines supported growth of animal viruses, and vats of tissue cell cultures replaced herds of animals as hosts for viruses needed in vaccine production. The host cells were strained out of the medium, leaving the viruses in high concentration with great savings in time, and effort compared to the processes involving infected animals. Some of the early poliomyelitis vaccines were produced in just such cell lines, but the practice was quickly stopped when the host cells were shown to be fully capable of forming cancer when injected into suitable laboratory animals.

Clearly, the transformed cells carried the cancer gene or genes on one or more of their chromosomes, even though a cancer virus did not seem to be present in the culture medium containing the polio virus. Subsequently, it was shown that although various cancer viruses tend to remain integrated in the chromosomes of transformed cells, infections of the transformed cells with certain kinds of viruses cause the release of the cancer virus from the cell.

The cancer virus did not always appear as a complete virus organism, or virion, but often consisted of only a small chromosome-like structure, the plasmid, that carried the genetic information for duplication, and genetic information for conversion of a host cell to the cancerous state. In many cases, the cancer plasmid required the cooperation of a "helper" virus to bring about the transformation of a normal animal cell to the neoplastic state.

Discovery of the cancer plasmid gave a tremendous boost to the proponents of genetic engineering, because it was a practical mechanism for integrating good plasmids into mammalian chromosomes to replace a bad gene or to restore missing normal genes. The human species alone suffers from more than 300 organic disorders caused by genetic defects; Sickle-cell anemia, color blindness, hemophilia, and hormone disorders are familiar examples.

Currently, only the general approach to genetic repair can be visualized. At present, (1) geneticists have only started to map the location of human genes on the chromosomes, (2) the required "good plasmids" still have to be discovered or synthesized, and (3) a benevolent virus or viruses must be produced that will carry the good plasmids into all the trillions of cells of the human body.

The first two requirements are the easier to meet, as current technology will soon supply necessary genetic maps and a "library" of good plasmids, but the last requirement of a suitable virus may block gene manipulation research in animals for a long time.

Theoretically, common influenza viruses should qualify: thousands of strains are already stored in virology laboratories around the world, and most important, the flu virus is one of the few types of viruses that can invade nearly all the different kinds of cells of the human body.

In addition, flu virus strains readily cross to form new hybrids, some of which are much milder agents of influenza than parent strains. Hybridizing influenza strains is potentially very dangerous business, for medical literature records the death of at least 20 million human beings from influenza in 1918-19, when a new influenza virus strain emerged

*Editor's Note: See relevant article by Ralph Reynolds, "Genetic uniformity—The growing Menace of Sameness", *The Furrow*, 80 (Issue 6):2-4, September-October, 1975. The author points out that farmers are planting the same basic varieties of sugarbeets, corn, potatoes, rice, soybeans, and wheat. He asks whether the stage is set for ecological disaster in this John Deere farm magazine (1400 Third Avenue, Moline, IL 61265).

from a three-way cross of less virulent common influenza strains.

Molecular geneticists have developed a much simpler system for conducting research on genetic engineering than the mammalian organisms, namely the bacterium *Escherichia coli* and a collection of bacterial plasmids that may be carried into the *E. coli* host cells directly through the bacterial cell wall. This type of gene manipulation has been described by Cohen.²

This system works so well that by 1974 the scientific literature recorded many successful transformations of *E. coli* by uptake of both naturally occurring and man-made plasmids; in addition, modified coliphage strains that had picked up as excess baggage, plasmids peculiar to one strain of *E. coli* could shed these plasmids inside cells of other strains of the *E. coli* host, with transformation resulting.

Plasmids of various other species of bacteria were integrated into the *E. coli* chromosome and a man-made plasmid derived from a toad embryo was taken up by about one in a million cells of a multimillion population of *E. coli*; the transformed cells faithfully copied the gene for a toad protein, generation after generation, and transcribed the messenger ribonucleoprotein (mRNA) needed for synthesis of this entirely foreign protein. This early work was done with *E. coli* purely by convenience, as it is so easy to grow, has an almost completely mapped chromosome, and has been the workhorse of molecular geneticists for nearly 30 years.

It was obvious that many, and possibly, all other species of microorganisms could also be transformed by plasmids, and the genetic traits that could be introduced by uptake of plasmids did not seem to be limited. It took little scientific imagination to visualize an experiment in which the almost harmless *E. coli*, for example, could be transformed by plasmids conferring the ability to invade the human tissues, to secrete both diphtheria toxin and botulinum toxin, to penetrate body cells and release the cancer gene, and to resist all known antibiotics.

Suddenly, the molecular geneticists realized that a nightmare situation was developing, or potentially could, if irrational or irresponsible scientists let loose the monsters created by plasmid transformation of chromosomes. The seriousness of the threat was illustrated when 139 scientists from 17 countries joined specialists from the fields of law and ethics, plus the press, and representatives of agencies that provide Federal funds for scientific research, for a three-day discussion at Asilomar Conference Center, Pacific Grove, California, in February, 1975.

Predictably, many different reactions and opinions were aired, but the consensus was that the genetic manipulation could work for good, even though risks were involved, and that continuation of plasmid genetics should carry adequate safeguards including use of organisms that could not live outside the special environment of the research laboratory.

The Federal granting agencies first ordered a moratorium on all research involving genetic manipulation, then cautiously permitted qualified molecular geneticists to resume relatively safe sponsored research on genetic engineering under the most careful containment conditions.

Looking ahead, the general public will probably react emotionally to the controversial issue of genetic manipulation, with some extremists hailing it as the miracle of the ages, and others cursing it as the foulest form of biological warfare.

Very possibly, nonscientific spokesmen from the political, religious, legal, and business communities will determine

the direction and extent of research permitted on gene manipulation, which restraint without scientific representation would do nothing to insure ethical application of the technique, while adding to the repressive nature of government.

Hopefully, an international forum, such as the World Health Organization, will provide a rational regulatory body for supervision of future research on genetic engineering.

From the creationist viewpoint, all species are "fearfully and wonderfully made", and scientists should be extremely cautious about over-riding the natural barriers to modifications of the genetic blueprint for each species. Without human intervention, mutant organisms almost always die or revert to the normal or "wild" type, and stray bits of genetic information are destroyed before the genetic control system of the organism is sabotaged.

In general, the more highly differentiated the organism, the more mechanisms there are present to keep the genetic apparatus from being damaged or modified. On this basis, it will be most difficult to produce permanent genetic alterations in the human being by means of the genetic engineering techniques now being applied to microorganisms.

—Contributed by Loyd Y. Quinn

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Quantum Psycho-Physics

A quantum-mechanical theory of consciousness was initiated by Dr. E. H. Walker in a paper on "The Nature of Consciousness", which appeared in *Mathematical Bio-Sciences*, 1970. Further details have become available in a series of publications and presentations, the most recent of which is "Quantum Mechanical Tunneling and Synaptic and Ephaptic Transmission", presented to an international symposium on Quantum Biology on Sanibel Island, Florida, 1974.

In my opinion, this theory may be one of the most important scientific discoveries in recorded history, although most people are not yet aware of the existence of this theory or of the following epochal implications:

(1) It is a valid scientific theory according to the accepted criteria advocated by the eminent philosopher of scientific method, Sir Karl Popper, because unique quantitative predictions about observable and measureable phenomena have been made from it, and these predictions can be readily confirmed or falsified by experiment.

(2) So far half a dozen successful predictions regarding brain organization and neurophysiology have been made from the theory. There have been no false predictions. Therefore, the theory must be accorded at least tentative scientific status. (Recall that Einstein's General Relativity was accepted after just three valid predictions.)

(3) There are profound and unavoidable metaphysical, philosophic and even religious implications. If it is correct, then von Neumann's proved and accepted *theorem* that the "hidden variables in quantum mechanics *can never be measured*" can be used to imply that consciousness, while *real*, is nevertheless *non-physical*.

(4) Quantum mechanics (the theory of microscopic energy transitions and of the structure of atoms and molecules) is the most successful of all physical theories; it has led to numerical predictions of incredible precision that

have been confirmed accurately in hundreds of thousands of different experiments.

But if the usual "Copenhagen interpretation" of quantum mechanics is accepted, human beings are demonstrably *capricious robots* in that all physico-chemical reactions in the brain, which ultimately can be reduced to individual quantum-mechanical transitions (e.g. jump of an electron from one molecule to another) are, in orthodox physics, supposedly purely *random events* (such as spontaneous radioactive decay).

Illustration:

At JHU Applied Physics Lab, an ascan that was made mobile with wheels and operative by means of internal electronic computers wandered around the halls, plugged into an electrical outlet when the batteries needed recharging, etc.

When it came to a corridor dead-end, it "decided" to turn *right* or *left* according as to whether or not an alpha particle was or was not at that instant being emitted from a radioactive sample calibrated to yield just one particle per second on the average.

Orthodox biophysicists say the human brain operates, as regards all of its quantum-mechanical transitions, exactly like the capricious robot. However, according to the new theory at hand, when a quantum-mechanical transition takes place in an animal brain, the process is not a random event but has been *controlled* by a non-physical entity, the brain's consciousness (or "spirit" or "soul").

(5) Little-known but repeatable experiments by French physicists have demonstrated that school-children can telepathically alter the rate of radioactive decay: the emission of alpha particles is, according to orthodox physics, a random "Poisson process", but the experimentally measured rate can be forced to deviate significantly from a Poisson process by human thought alone.

(6) Thus, experimental evidence can be fitted into the new theory to scientifically resolve the ancient philosophical and psychological problem of whether or not man has *free will*. Indeed he does.

(7) In conclusion, at one stroke this new theory resolves three basic and long-standing puzzles:

(i) man's subjective feeling of free will versus implicit denial of it by orthodox scientific *reductionists*;

(ii) simple resolution of the paradoxical "measurement problem" in quantum mechanics (i.e. this most basic of all physical theories simply cannot be formulated consistently without inclusion of the consciousness of some observer, a riddle that has agonized many Nobel Laureate physicists for half a century);

(iii) hard evidence of the possibility that thought can affect matter at a distance, as in ESP and PK experiments, is not incompatible with the most rigorous formulations of physical science.

To summarize the preceding seven points in non-specific language, one might say the following: In 1974 scientists have at last discovered hard evidence that human beings have real but non-physical "spirits" or "souls" which can control matter—rather than conversely—and can interact at a distance without physical media of transmission.

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5. Application of the Quantum Theory of Consciousness to the Problem of Psi Phenomena, presented to Fifteenth Annual Meeting of the Parapsychological Association, Sept. 3-5, 1972, Edinburgh, Scotland; *Research in Parapsychology*, 1972, 51-53.
6. On Problems Associated with the Copenhagen Interpretation of Quantum Mechanics, *Bulletin of the American Physical Society*, Series II, Vol. 18 (1973), 144.
7. Quantum Mechanical Processes in Synaptic Transmission, *Biophysical Society Abstracts*, Seventeenth Annual Meeting, Vol. 13 (1973), 131A.
8. A Mathematical Theory of Optical Illusions and Figural After-effects, *Perception and Psychophysics*, Vol. 13 (1973), 467-486.
9. Quantum Mechanical Processes in Ephaptic and Synaptic Transmission, presented to International Symposium on Quantum Biology and Quantum Pharmacology, Sanibel Island, Florida, January 17-19, 1974.
10. Science/Consciousness/Religion, *Science of Mind*, Vol. 47 (Apr. 1974), 34-43.
11. Consciousness and Quantum Theory, a chapter in *Psychic Exploration*, Edited by Edgar D. Mitchell, Putnam, New York, 1974.
12. The Scientific Study of Consciousness and its Significance for Religion, in *Toward a Science of Consciousness*, Edited by J. W. White, W. A. Benjamin, Menlo Park, California, 1974.
13. Quantum Mechanical Tunneling in Synaptic and Ephaptic Transmission, to appear.
14. Foundations of Parapsychology and Paraphysics, presented to the Parapsychology and Quantum Mechanics Symposium, Geneva, September 1974. To appear in the symposium *Proceedings*, Parapsychology Foundation, New York.
15. Existence of a Second Reality: The Evidence From Quantum Mechanics, presented to the Seventy Third Annual Meeting of the American Anthropological Association, Mexico City, November 1974.

—Contributed by Robert W. Bass

BOOK REVIEWS

Crash Go the Chariots by Clifford Wilson 1972. New York: Lancer Books. 126 pp., \$1.25 and *Gods in Chariots and Other Fantasies* by Clifford Wilson 1975. San Diego: Creation-Life Publishers. 144 pp., \$1.50.

Reviewed by Erich A. von Fange*

In the 1972 volume Wilson cites a number of points where Erich von Daniken author of *Chariots of the Gods?*, is obviously in error, a task not very difficult to do. While

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one can agree with Wilson's conclusions that the Bible is a faithful but incomplete account of some aspects of man's ancient history, Wilson does not offer much in the way of evidence to refute the very popular series of books by von Daniken. Perhaps it is simply too much to believe that anyone can really take von Daniken seriously despite his great current popularity as author and as lecturer on the college circuit.

Wilson's 1975 volume is essentially a scissors-and-paste project drawn from his radio broadcasts of questions and answers on matters related to von Daniken and other topics.

The reader will be startled by the attempted scope of the slender volume: von Daniken's writings, the current U. F. O. scene, and the movie, *The Exorcist*. All are viewed as Satanic in origin by Wilson.

Wilson again points out obvious errors in von Daniken's erratic writings. Yet Wilson is not always careful himself. In speaking of Babylonian tablets which state the rulers lived as long as 60,000 years, Wilson is apparently not aware that the time period of a "saro" has two meanings, and that the preferred meaning gives periods of time amazingly close to the ages of the Pre-Flood patriarchs. Wilson states that Admiral Byrd is often quoted as seeing some beautiful lush country with lakes, forests, and mountains in 1947 when he flew beyond the North Pole. Wilson would have done better by quoting what Admiral Byrd actually said: "I'd like to see that land beyond the Pole. That area beyond the Pole is the center of the great unknown".

Wilson believes that he has seen U. F. O.'s on at least two, and possibly three occasions, and that thousands of messages have been directed earthward from U. F. O. occupants. Most readers will hold that unexplained sightings are hardly evidence that U. F. O.'s actually exist.

Although criticisms such as these may be made, these books can be very useful in providing ready arguments with which to meet the speculations advanced by von Daniken and others, whenever they may be encountered.

The reader who is interested in a further devastating critique of the writings of Erich von Daniken might well read Thiering, Barry, and Edgar Castle, Editors. 1972. *Some Trust in Chariots*. Popular Library, New York, 128 pages, \$.95.



Vertebrate Development by Harold W. Manner. 1975. Kendall/Hunt Publishing Company, 2460 Kerper Boulevard, Dubuque, Iowa 52001. 242 pages, \$8.95.

Reviewed by Duane T. Gish*

Textbooks on any scientific subject devoid of evolutionary assumptions are rare indeed; but here is an excellent one, at the undergraduate level, on vertebrate embryology, by the Chairman of the Biology Department, Loyola University, Chicago. Dr. Manner, an outstanding Christian and creationist, has restricted his text to vertebrate embryology without encumbering it with irrelevant and erroneous "evolutionary" speculations. Reading a book like this is like breathing a breath of sparkling clear air.

Part I of Dr. Manner's book is devoted to general embryology in which embryological terms and processes are explained. Part II is a description of the embryology of Amphioxus and of representatives of the vertebrate classes Osteichthyes (the fathead minnow, *Pimaphales promelas*), Amphibia (the grassfrog, *Rana pipiens*), Reptilia (the painted turtle, *Chrysemys picta*), Aves, (the chick, *Gallus gallus*), and Mammalia (the pig, *Sus sp.*), with reference to the human.

The book is well-targeted at the undergraduate level, is easily readable, and is well illustrated with many line drawings. For these reasons alone it is highly recommended for use in all colleges at the undergraduate level; but it is especially well suited for use in Christian schools because it is devoid of evolutionary assumptions and because of the clear

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Christian testimony expressed by Dr. Manner in his preface and through the Scripture verses on the initial pages of each chapter.



In the Beginning God by Clifford Wilson. 1975. Baker Book House, 142 pages, no index, paperback, \$2.50.

Reviewed by Bolton Davidheiser*

This is a book of questions and answers, having to do with evolution and other matters. One is constantly reminded that it is one man's opinions, as the questions are formed: What do you believe . . . ? Do you accept . . . ? Do you recognize . . . ? And the answers: I believe . . . I accept . . . I recognize . . .

This is not to mean that the opinions of others are excluded. Quite the contrary. As to the nature of the six days of creation, the author says that as an archaeologist he is not particularly concerned about creation, and tells of 14 points of view on the matter; the reader may make a choice.

At the beginning of the discussion of the gap theory, it appears Wilson holds that view, but later it seems he does not, although the reader is not quite certain.

The "Questioner" points out that the author is not committed to "progressive creationism", nor to theistic evolution, nor to six literal days of creation, and asks for clarification of his view. The reply seems rather unintelligible.

The text is generally weak and wishy-washy, at a time when a firm stand is needed. The author quotes frequently and favorably Bernard Ramm, which to this reviewer is sufficient evidence of lack of discernment.

The bibliography contains books, which, this reviewer would say, the Christian reader should be warned about, not encouraged to purchase, such as: *The Christian View of Science and Scripture* by Bernard Ramm; *Evolution and Christian Thought Today*, Edited by Russell L. Mixer; and *Evolution and the High School Student* by Kenneth Taylor.

The author also wrote the book *Crash Go the Chariots* (Lancer Books, \$1.25) in answer to Erich von Daniken's best-selling *Chariots of the Gods?* Wilson's answer is a needed and well-written book and is recommended rather than the one just reviewed.

There are a number of good books on evolution from the Christian point of view and it is hard to see what will be accomplished by this volume. But likely it will do well at the typical "Christian bookstore".



Strange Artifacts: A Sourcebook on Ancient Man compiled by William R. Corliss. 1974. Glen Arm, MD, 21057: Distributed by the Author. 262 + vi pp. \$6.95 and *Strange Planet: A Sourcebook of Unusual Geological Facts* compiled by William R. Corliss. 1975. Distributed by the Author. 283 + vi pp. \$7.95.

Reviewed by Erich A. von Fange†

Corliss deserves commendation for developing a simple but very valuable idea. Once one has the above compilations, they become too interesting and useful to do without.

Using a carefully drawn up set of categories, the author prints articles or excerpts of articles as originally published in a wide span of scientific journals and other sources.

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These provide prime source materials as far back as 200 years ago for the reader who does not have access to such materials. The sourcebooks are well indexed by subject, author, and source.

Corliss does not attempt to push any specific theory of geology or prehistory. His special interest is in the anomalies that should not exist according to conventional theory. It goes without saying that much of his material is of special interest to C. R. S. *Quarterly* readers.

Corliss states, and I would agree, that geology is the "prisoner" of dogmas that have had great influence on scientific thought: the dogma of uniformity (and uniform-

itarianism), the dogma of evolution, and the Ice Age dogma. While he emphasizes again that he is not a partisan for competing theories, the value of his compilations lies in the large amount of original material he has reprinted that controverts these dogmas, which have become "sacred cows".

He acknowledges that his sources are uneven as to their possible credibility. The reader must judge.

The above volumes are merely the start of a series of publications. Several other volumes already published will be of lesser interest to most readers, but other future volumes will be of great value. The books noted above are highly recommended.

LETTERS TO THE EDITOR

On Allelic Differences and Sizes of Populations

May I comment on the recent letter¹ by Dr. Walter E. Lammerts?

Table 2 in his letter can be expanded as shown in Table 1 accompanying this letter. The expansion is rather easy. If N is the number of allelic differences, then the population size required to express all the variation potential is 2^N .

Let M be the number of characteristics for which an individual is heterozygous, H_M being the number of individuals in the population which are heterozygous for M characteristics. Now $H_0 = H_N = 2^N$; also $H_M = [(N + 1 - M)(H_{M-1})]/M$.

For instance, if $N = 9$ characteristics, the population size is 2^{18} or 262,144. Also, H_0 , the number of individuals heterozygous in none of the characteristics, is $2^9 = 512$. Let $M = 1$. The $H_1 = [(9 + 1 - 1)(512)]/1 = 4608$ individuals heterozygous for one characteristic.

For 5,000 characteristics, the required size of population is $2^{10,000}$ or approximately $1.9950631 \times 10^{3010}$. And $H_0 = H_{5000} = 1.4124670 \times 10^{1505}$. If there had been 5,000 gene differences to start with, the probability of any individual being heterozygous for all of them is therefore ridiculously small, just as Dr. Lammerts pointed out.

Now let us notice another important fact about Table 1. For four characteristics, 176 individuals out of 256, or about 68.75% of the population, are heterozygous for half or more of the four characteristics. When $N = 10$, the corresponding number is 62.3046875%. As N increases, the number of individuals heterozygous for half or more of the characteristics approaches 50%, assuming random breeding and a sufficiently large population.

Let us notice also that for eight characteristics, the number of individuals heterozygous for at least $\frac{1}{4}$, but not more than $\frac{3}{4}$, of that number is 60,928 out of a population of 65,536, or 92.96875%. For 12 characteristics, it can be shown that over 96.14% of the population would be heterozygous for at least $\frac{1}{4}$, but not more than $\frac{3}{4}$, of the 12 characteristics.

Thus if there were 12 characteristics and a sufficiently large population, and an individual were chosen at random from that population, it is highly probable that the chosen individual would be heterozygous for somewhere between $\frac{1}{4}$ and $\frac{3}{4}$ of the original 12 characteristics. And, if this trend is extrapolated to a much larger value of N and a much larger population, then a randomly chosen individual would probably be heterozygous for roughly half of the original number of characteristics.

Let us assume that there are 5,000 allelic differences in the human family today. It is *not* necessary to assume that there were *only* 5,000 allelic differences in Adam and Eve, and that somehow these were all preserved in Noah and his family, by their being heterozygous for all of the differences. Nor is it necessary to assume that these 5,000 allelic differences were re-created after the Flood.

The only assumption required is that in Adam and Eve there were at least 10,000 such differences. Then it would be extremely probable that an individual descendant of Adam and Eve, selected at random, would be heterozygous for 5,000 of these original characteristics.

Thus, the characteristics observed in mankind today are simply those which happened to be present in Noah and his family. Many, perhaps half of the number, of those which came originally from Adam and Eve were lost in the Flood. (The number of allelic differences may, as Dr. Lammerts

Table 1. Distributions of 1 to 10 characteristics, assuming random breeding

N	Pop.	Number heterozygous in this many characteristics:										
		0	1	2	3	4	5	6	7	8	9	10
1	4	2	2									
2	16	4	8	4								
3	64	8	24	24	8							
4	256	16	64	96	64	16						
5	1024	32	160	320	320	160	32					
6	4096	64	384	960	1280	960	384	64				
7	16384	128	896	2688	4480	4480	2688	896	128			
8	65536	256	2048	7168	14336	17920	14336	7168	2048	256		
9	262144	512	4608	18432	43008	64512	64512	43008	18432	4608	512	
10	1048576	1024	10240	46080	122880	215040	258048	215040	122880	46080	10240	1024

N = Number of characteristics (allelic differences), and
Pop. = Population size required to express all the variation potential this value of N

mentioned, be as great as 120,000; but the same arguments apply.)

Dr. Lammerts asked: "If Noah did not have the potential for transmitting the gene differences for the various races of mankind (because he could not possibly have been heterozygous for all of them) then how did they originate?" For the reasons discussed above, I suggest that there is no problem here, and that Noah was heterozygous for all of the characteristics *now* seen in mankind. (Or at least, all of the present characteristics were represented in his three sons and their wives.)

But a problem certainly does arise when consideration is given to the large number of highly similar but non-interfertile species which exist among land animals. Today the horse kind is represented by at least three species which are not completely interfertile. If there were only about 2,000 animals in the Ark, as has been suggested, the horse kind must have been represented by a single pair. These two animals must have been a generalized sort of "horse" which gave rise to the different species *via* a process which cannot be reversed today. That process must have been either supernatural or natural.

If it was supernatural, as Dr. Lamerts suggested (although he did not base his argument on the small number of animals in the Ark), then the process cannot be understood.

But if natural, it presents a great mystery. How could the generalized horse have "devolved" into separate species which cannot be bred back together again? The only other solution would seem to be that every species of land animal ("species" being defined with reference to fertility) was present in the Ark.

Reference

¹Lammerts, Walter E. 1975. Concerning the natural vs. the supernatural, a reply to Henry M. Morris, *Creation Research Society Quarterly*, 12 (1): 75-77.

Respectfully submitted,
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Contradiction!

According to an article, "In Search of Noah's Ark" on pages 150-154 of *The Reader's Digest*, September, 1975, fossilized wood found by Fernand Navarra, and believed to have come from the Ark of Noah, was tested at various universities by radioactive Carbon-14 and by wood analysis.

The Carbon-14 tests gave ages of 1,200 and 1,400 years respectively. (It is a bit of a change to read of something being tested which did not turn out to be millions of years old.) However, one wonders why something this "recent" should not give constant results. The same test on the same specimen should give the same result each time it is performed, should it not?

Wood analysis of this specimen gave an age of 5,000 years. Surely these results reveal that something is seriously wrong with either the Carbon-14 tests or the wood analysis, or perhaps both of them. When there is a difference of about 80% (1,200 vs. 5,000 years) on a "recent" specimen, one wonders how much error would be involved with a specimen "millions" of years old.

Since this specimen is said to be "petrified" or "fossilized", are the scientists granting that a "fossilized" specimen is only between 1,200 and 5,000 years old? (The relevant issue is not whether the specimen came from the

Ark, but whether a "fossil" can be so young.) Formerly, most scientists seem to have claimed that all fossilization and petrification took place millions of years ago. This should cause problems for "evolutionary" scientists.

Respectfully,
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Clarification About Rampart Cave

Creationist writers should take every possible precaution to be sure that they have the facts right. Of course, so should everyone; but creationists are in a special position. For if they publish things which are later found to be wrong, they may be sure that such an instance will be pointed to in attempts to discredit creationists in general (even though a type of guilt by association technique).

To say this is not to plead for timidity or excessive caution. Creationists should go on with their work, when they have done all that is possible to ascertain the facts, knowing that they are human, and that to be human is to be fallible. But it is possible to take precautions, both by one's own efforts and—what is easier now that there are many more known creationists—by consulting with others.

Having said this, may I now proceed to take my own advice?

In my recent item about Rampart Cave¹ I made the statement, "Sloth dung in this deposit has a continuous sequence of radiocarbon age up to 10,000 B. P." This statement might lead to incorrect conclusions and should be clarified.

It is true that radiocarbon ages for sloth dung in Rampart Cave cover the range between "infinity" and 10,000 B. P. It is not true that sloth dung from every cm-thick layer in the 137 cm accumulation of organic remains in this cave has been radiocarbon dated.

About 25 cm of the profile plot shown in the *Quarterly* (page 67) is a packrat midden—the knee portion of the plot. Some sloth dung is found in the packrat midden level, but I am not aware of any C-14 data that indicate whether this sloth dung was stirred up from lower levels by rats or has an age consistent with other organic material at the same level.

If one draws a best-fit curve through only the sloth dung points given in the article cited in *Science* it is possible to get an average rate of increase of thickness as great as .015 mm per C-14 year, prior to 13,000 C-14 years B. P., rather than the .005 mm per C-14 year rate based on sloth, goat, and packrat dung.

The less steep portion of the profile plot, given in the *Quarterly*, is based entirely on sloth dung data.

Readers who may be interested in pursuing this topic further will enjoy the article by Paul S. Martin in *Natural History*, August-September, 1975, pages 74-81.

Reference

¹ Brown, R. H. 1975. Can we believe radiocarbon dates? (in *Panorama of Science*), *Creation Research Society Quarterly*, 12 (1): 66-68.

Cordially yours,
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Comment on Conditions Before the Fall

I refer in this letter to the Editor's remarks "In Retrospect" at the end of the Letters to the Editor, on page 179 of the *Quarterly*, December, 1974.

Without making any pretensions to learning, I should like to present my viewpoint on some points offered by the Editor, and in the preceding letters.

As to point (1), I will not meddle, but will let those who are masters of the matter speak about it. I think, though, that there is a lot to be said on each side which has not yet been said, and that saying it might clarify these arguments at least a little.

As to point (2), I feel free to state that I feel amazed at hearing of "natural deficiencies" before man's sin, as that squarely contradicts God's statement of His creation being "very good" (Genesis 1:31). I don't think that Thomas Aquinas is reliable at all here.

Since God's creation was "very good" there was not any deficiency, for it had the seal of the Creator: perfection. But when its head (man) rebelled against God, and fell, it, in a sense, fell with man.

We see deficiencies now; nay, not only this, but death, disgrace, disharmony, murder, fighting, as a result of man's sin. Since all the earth was put under man (verses 28 and 29) it all fell with him.

As to point (3), I fully agree, although I don't feel able to state by what means God was going to do it. I know that *death came into the world through sin*, as is clearly inferred from Romans 5:12. It must follow, then, that before sin there was no death in the world. Note that it is not merely that death was not in the human race, it was *not in the world*.

But as for how God would have controlled the population, had man not sinned, or how He would have provided more space to dwell in, I think that that falls within the scope of Deuteronomy 29:29. We are always in danger of falling into fruitless speculation if we inquire into what some things would be like were others different.

As to point (4), I agree that the surest thing is to rely on Scripture; and that the answer proposed under (5) is likely true. When Scripture calls a category of God's creation "living souls", I think it is plain that the only things which can undergo death are living things.

Are we to think for a moment that the gift to man, and to beasts, of herbs bearing seed, fruit trees, and green herbs, to eat, involved the death of these plants, scripturally speaking? They are not called "living souls".

Were they not intended to be structures to change mineral materials into organic food for the "living souls", including man? So vegetables, and all herbs, have no life, in the Scriptural sense; hence they cannot die.

As to Mr. Jansma's statement that only man was intended to live forever, I cannot agree. Another author whom I have read put it this way: Man was created to life, but animals to death. But there is not a shred of Scripture to support such a statement. Man fell in sin, and *with him fell the rest of creation*, of which he was the head.

I think that a careful consideration of Romans 8:19-23 conveys to us the thought that all the living creation under Adam fell in the same fall as Adam. And the fall brought death upon them all.

It is true that only man, if he does not repent, reaps the eternal consequences of rebellion against God. Animals have not a moral nature which can subsist after the material part is dissolved. But it does not follow that they were intended to die.

The fact that the animals have not a moral nature, and are infinitely far away from having been created in the image and likeness of God, does not exclude them from the capability of having their role in a world which—let's suppose—would never have been marred by man's sin, and in which they would never have died. Mr. Jansma connects potential immortality with having a moral nature. (By "immortal" I mean "not dying"; I am not thinking of the sense in which man, though dying, is yet immortal. Also, the immortality, of course, is given; only God *has* immortality.)

I think that the fact of living forever in the case of animals (as it would have been had Adam not sinned) has to do with their having been created as "living souls". If not, why should Scripture refer to a wide range of God's creatures as living souls, as in Genesis 1:20, 21, and 24, in such a remarkable parallelism to the reference to man in Genesis 2:7? There is, of course, the great separating fact that man has a moral and spiritual nature which is entirely lacking in the animals.

Sincerely,
in Jesus Christ our Lord,
Santiago Escuin Sanz
Avda. Paraires 21, 2^a, A
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Dogs Provide No Evidence For Evolution

The Washington Square Press book 47252, *Anthropology*, by Samuel Rapport and Helen Wright reads as follows on page 10:

"We know that evolution has not only taken place in the past but is still taking place, as you can see for yourself if you consider for a moment the history of the dog. The numerous races of present-day dogs, ranging from St. Bernard to Dachshunds, have all evolved in the last few thousand years from one, or possibly a few, very generalized kinds of dogs which were domesticated by man towards the end of the Stone Age. Of course, this very rapid evolution is unusual and has been greatly accelerated by man's careful selection of breeding stock."

In order to believe that the dog evolved from a lower form of life, one must believe also that evolution from a lower form, due to mutations, proceeds more rapidly than the diversification of life due to mutations.

Yet even evolutionists know that the diversification of life is much more rapid than they would expect evolution from lower forms to be. Therefore, in order for the dog to have evolved from a lower form of life it would have had to do the impossible.

Sincerely yours,
George M. Schopp
36 Madison Street,
Pequannock, N. J.

Who was the Pharaoh of the Exodus?

May I comment on Courville's review of *Adam When?* by Harold Camping on pages 116-118 of the *Quarterly*, September, 1975?

Dr. Courville objects to identification of Thutmose III as the Pharaoh of the Exodus because of "the large improbability that the body was recovered and returned to Egypt for burial." In that case one would do well to look carefully at the mummy currently labelled Thutmose III in the mummy room of the Cairo Museum. This has been done through X-ray examinations carried out by James

Harris and his colleagues in the department of Orthodontics from the dental school of the University of Michigan.

According to his highest dated inscription, Thutmose III ruled late into 54th regnal year, and he must have been a child of a few years at least when he came to the throne. Thus one might estimate that he was a minimum of 60 years old when he died and may have been older still.

This figure is interesting in view of the fact that Harris and Weeks state from their examination of the mummy in question that "the x-rays do not support such an advanced age." (*X-Raying the Pharaohs*. 1973. Scribner's Press, New York, p. 138). According to a preliminary discussion of the films by a noted physical anthropologist from the University of Chicago, based upon the appearance of growth and suture lines of the skull and long bones, this particular mummy shows a probable age of 40 years with the upper limits for that age at 45.

It should also be recalled that the mummy currently labelled Thutmose III did not come from the tomb of Thutmose III in the Valley of the Kings, but from the cave where the royal mummies were stashed during the troubled days of the 20th Dynasty, and it was rewrapped and labelled at that time.

It remains to be seen whether we have the body of Thutmose III or not. Courville may hold that we do, but there are considerable obstacles to that identification that have not yet been surmounted.

Yours truly,
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The Waters Above the Firmament

A model of the antediluvian Earth, common among creationists, is the vapor canopy model. Actually, a canopy was proposed at least as 100 years ago by Vail;¹ but since then the notion has been sometimes proposed explicitly, sometimes assumed implicitly.

A multitude of meteorological conditions common to our age would, it is believed, have been precluded by the existence of such a canopy. Among those conditions would have been such malefic phenomena as hurricanes and tornados. The reasons why a canopy would have such an effect have been adequately presented and will not be repeated here. Many believe that there was no rain before the Flood; that, too, could be a consequence of the canopy.

The compatibility of a perfect climate with the concept of an initially perfect Creation has served to promote widespread acceptance of this model, sometimes, it seems, to the near exclusion of any other.

Many creationists have become so enamored with the vapor canopy idea that they have overlooked a crucial point in Scripture, which is certainly a difficulty for the notion of the canopy, and could point out a fatal flaw.

The basis of the canopy model is Genesis 1:7: "And God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament . . .".

The firmament includes the lower atmosphere, according to Genesis 1:20: ". . . fowl that may fly above the earth in the open firmament of heaven".

However, on the basis of the vapor canopy model, an incompatibility occurs in Genesis 1:14: ". . . Let there be lights *in* the firmament of heaven to divide the day from the night; and let them be for signs . . ." (Emphasis added)

The designation as signs makes it clear that light sources are meant, as opposed to light in general.

Also in verse 17: "God set them *in* the firmament of the heaven to give light upon the earth". (Emphasis added)

Since the two great lights were placed *in* the firmament, while the waters above the firmament were *above* it; if the waters above the firmament were a vapor canopy, the sun and moon would have been *beneath* the canopy. Hence, the waters above the firmament must have some meaning other than the earth-encompassing shroud of water vapor so often proposed.

Reference

¹See the note "More on a Water Canopy" on page 52 of the *Quarterly*, June, 1975.

Yours sincerely,
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Comment on "The Theological Necessity of a Young Universe"

The article mentioned, by Ingram,¹ is, to me at least, unconvincing; nor can I follow much of his reasoning.

In the first place, no such necessity is mentioned in the Bible. Rather, it is just stated that God created—period. Beyond that we dare not go.

Nor can I agree that the issue is between the "gradualists" and those who believe in a young earth. Rather there is an issue between those who take the Word as it stands and those who add to it—or fail to consider it at all.

To postulate the theological necessity of a young universe is to create a heavy and unnecessary burden for Scripture. For the only reason for making such a postulate would be a rigid adherence to the genealogies as guides to chronology. But even Whitcomb and Morris are willing to admit abbreviated genealogies. Let us not be overly hasty here.

It is true that a young universe demands special creation by fiat, but it does not necessarily follow that special creation by fiat demands a young universe. On that point, I keep my mind open. I believe that Scripture does not clarify the issue, and that philosophical reasonings such as Ingram's may cloud it. Incidentally, Ingram made only one direct reference to Scripture, and it may be questioned whether the use there was a valid one.

The point that there is a limit to time seems valid, biblically speaking. But whether the limit consists of thousands or billions of years hardly makes any difference. For 2 Peter 3:8 could apply equally well here: ". . . one day is as a thousand years . . ." Since God does not change, and is eternal, the duration of the universe, however long it may be, is still as nothing in comparison with Him.

Ingram's discussion of knowledge of God was generally good. It is true that much theological knowledge of God can be expressed in the negative, although in Scripture, and especially in the revelation in the Son, we have much which is positive. But what can it mean to say that the path to the knowledge of God is through a thorough understanding of time? Surely knowledge of God comes through Scripture, and through the Holy Spirit.

Also, is *Hamlet's Mill* seriously proposed as a witness to the accuracy of Ussher's chronology?

(continued on inside back cover)

THE FLAT EARTH FELL FLAT LONG AGO

I have seen several times, in items written with a Christian purpose, statements to the effect that even well into the Middle Ages people, even educated ones, believed that the Earth was flat. Often this was accompanied by some mention of Galileo. Sometimes the fable was included, which used to be heard in elementary school and perhaps has not yet entirely vanished, to the effect that Columbus was the first man to believe that the Earth is round.

The purposes behind such a statement seem to be varied. In arguments in favor of a liberal interpretation of something, it may be intended to show that these men of old were easily deceived. In conservative writings, the idea is often to show that the old Churchmen should not be followed in their supposed acquiescence to some kind of evolution. (Actually, I am not persuaded that men of old believed in anything which could fairly be called evolution; but that is another question.) But the statement that educated men, in the European societies at least, at the time

It is always a mistake to depend on hearsay or on second-hand sources. Let us see what some men actually wrote in ancient and mediaeval times.

Plato, in the *Timaeus*, written some time around 360 B. C. or so, stated that the Earth was round, and gave teleological reasons for the shape. Aristotle, in his work *On the Heavens*, Book II, Chapter 14, written presumably about 330 B. C., remarked that the Earth was spherical, and quoted an estimate of its circumference.

St. Augustine, in his *City of God*, Book XVI, Chapter 9, written around 400 A. D., wrote, in Latin: "... although the world is believed or has been demonstrated by reasoning to be spherical ...". He was conceding the shape, but doubting that the other side was inhabited. Note that in his writing here the word "Antipodes" means, not the place, but its inhabitants, if any.

St. Thomas Aquinas, in his *Commentary on Aristotle's "On the Heavens"*, *Lectio XXVII*, written around 1260 A. D., wrote: "... first he (Aristotle) proves that the Earth is spherical by physical reasoning, then by mathematical and astronomical reasoning". (Again in Latin.)

As for Galileo, his disagreement with the authorities had to do (among other things) with the Earth's motion or rest, not the Earth's shape. Authorities of his time agreed that the Earth was round. For some valuable thoughts on what happened about that time, see Cooper, Lane 1935. Aristotle, Galileo, and the Tower of Pisa. Cornell University Press.

Columbus, in believing that the Earth was round, believed no more than did any educated contemporary. Members of his crew, of course, may have believed that the Earth was flat, and many other strange things too.

Actually, there is reason to believe that a curious jumble of misinformation about the size of the Earth, and the extent of Asia, encouraged Columbus to make his attempt. Had he known the true distance westward from Spain to Asia, he might well have conceded that his fleet could not make the voyage. See Fischer, Irene 1975. Another look at Eratosthenes' and Posidonius' determination of the Earth's circumference, *Quarterly Journal of the Royal Astronomical Society*, 16 (2): 152-167. See especially page 164.

It is always a pity when an argument, which is good in the essentials, seems to be refuted because it is mistaken on some incidental point. This matter of ancient beliefs about the shape of the Earth is one point on which creationists (and others too) can avoid including an Achilles heel in their arguments.

—Editor Armstrong

Possible Evidence About the Time of the Flood

Most creationists, nowadays, believe that the Flood was a very important event. While this belief does not depend on knowing just when the Flood occurred yet it is natural to wish to know. The information given in Scripture should determine the time, but there is no total agreement about the interpretation of certain statements.

It may be useful, then, to consider any auxiliary information possible. Such information, of course, will not have the authority of Scripture, but it may have some corroborative value.

Here is one possible bit of information, for whatever it may be worth. The Roman author, Censorinus, in his book, *De Die Natali*, written in about the third century A. D., stated that the course of human events is considered to be divided into three ages.

The first age, from the beginning of man to the prior cataclysm, was called *adelon*, i.e., obscure. The second, from the prior cataclysm to the first Olympiad, was called mythical, because the events of many of the classical myths happened then. The third was called historical.

Censorinus did not pretend to know how long the first age had lasted. The second, he stated, was commonly believed to have lasted about 1,600 years.

Now the first Olympic games are commonly said to have been held in 776 B. C. So the prior cataclysm would have happened about 2,400 B. C. If the prior cataclysm was the Flood, this result agrees fairly well with many straightforward chronologies.

In calling the cataclysm prior, Censorinus was likely thinking of the opinion, which seems to have been common in classical times, that there was an earlier flood, before that of Deucalion. Aristotle said somewhere that Deucalion's flood was confined to parts of Greece; it may have been considered that the earlier one was universal.

Incidentally, Censorinus appears to have been writing as a pagan, not as a Christian or a Jew. It might be, of course, that he had information from Christian or Jewish sources, although he cited nothing as such.

—Contributed by Harold L. Armstrong

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MODEL VS. ANALOGUE

Often in science much is said about models; a writer will assert that something is a model of this or that. It may be worthwhile to consider very briefly just what is meant by a model.

A model ship, for instance, would be like the original in everything except size. This is an ideal, but some compromise on detail might be involved. For instance, a model ship may be solid wood, although the original was hollow. (And there may be other differences; we all remember the joke in which the woman said that her husband was a model husband, but unfortunately not a working model!) But the ideal model, it would appear, is one which is like the original in everything but size.

There are also analogues. The common use is in analogue computers, where, for instance, electrical oscillations in a circuit will simulate the vibrations in a structure. These analogues have a very considerable use in engineering, making it possible to study something which is not readily solved theoretically, and which it is not practicable just to build and try. The analogues are often electrical; but that is just because the electrical components are easily available.

Now the difference is this: a model is like the original in as many respects as possible, except size; but an analogue is like the original in one respect only. The electrical circuit, e.g., would not look anything like the structure; but it would give a behavior similar to vibrations in some structures.

The point is, a distinction should be made between models and analogues. If something reproduces the behavior of something else in one respect, the one is an analogue of the other; but it may well not be a model.

For instance, Bohr set out to investigate the light emitted by hydrogen. He showed that if there should be two electrically charged particles, in such and such arrangement and motion, the particles would give off wavelengths such as are, in fact, found in the light from hydrogen.

So the picture of the atom, commonly drawn, is an analogue, in respect to the light emitted. But it is not necessarily like the hydrogen in other respects; it is, in terms of the distinction just proposed, an analogue, not a model. It is true that people often speak of Bohr's model of the atom; but it seems plain that, in terms of the present distinction, an analogue is meant.

It is to be noticed then, that an analogue is not necessarily a model. One thing may resemble another in one respect, without being like it in all respects. Atoms of hydrogen are not necessarily really as shown in the pictures; in fact, nowadays nobody believes that they are.

People sometimes speak of models of e.g. the growth of population, but it is clear again, from what has been said, that analogues are meant.

So Darwinian evolution, for instance, might be an analogue, in the sense that if processes of variation and selection had taken place, the result would be a diversity of creatures. (Even at that there would be difficulties, e.g. the absence of missing links.)

But even if evolution were an analogue, that would still not show that it is a model, in the sense of the distinction made here, let alone the real thing. So those who maintain that evolution is the real thing are acting as the engineer would were he to maintain that his network of resistors, etc., was actually the structure which was being investigated.

—Contributed by Harold L. Armstrong

CREATION RESEARCH SOCIETY

History The Creation Research Society was first organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a real need for an association devoted to research and publication in the field of scientific creationism, with a current membership of about 500 voting members (with graduate degrees in science) and over 1600 non-voting members. The *Creation Research Society Quarterly* has been gradually enlarged and improved and is now recognized as probably the outstanding publication in the field.

Activities The Society is solely a research and publication society. It does not hold meetings or engage in other promotional activities, and has no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund is maintained to assist in such projects. Contributions to the research fund for these purposes are tax deductible.

Membership Voting membership is limited to scientists having at least an earned graduate degree in a natural or applied science. Dues are \$8.00 (Foreign, \$9.00 U. S.) per year and may be sent to Wilbert H. Rusch, Sr., Membership Secretary, 2717 Cranbrook Road, Ann Arbor, Michigan 48104. Sustaining membership for those who do not meet the criteria for voting membership, and yet who subscribe to the statement of belief, is available at \$8.00 (Foreign, \$9.00 U. S.) per year and includes subscription to the Annual Issue and Quarterlies. All others interested in receiving copies of these publications may do so at the rate of the subscription price for all issues for one year: \$11.00 (Foreign, \$12.00 U. S.).

Statement of Belief Members of the Creation Research Society, which include research scientists representing various fields of successful scientific accomplishment, are committed to full belief in the Biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution), both of the universe and the earth with its complexity of living forms.

We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. In 1970 the Society published a textbook, *Biology: A Search for Order in Complexity*, through Zondervan publishing House, Grand Rapids, Michigan 49506. Subsequently a Revised Edition (1974), a Teachers' Guide and both Teachers' and Students' Laboratory Manuals have been published by

Zondervan Publishing House. All members of the Society subscribe to the following statement of belief:

1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.

2. All basic types of living things, including man, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.

3. The great Flood described in Genesis, commonly referred to as the Noachian Flood, was an historic event worldwide in its extent and effect.

4. We are an organization of Christian men of science who accept Jesus Christ as our Lord and Saviour. The account of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Saviour for all mankind. Therefore, salvation can come only through accepting Jesus Christ as our Saviour.

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(continued from page 221)

Let me say, in conclusion, that, in pointing out what I believe to be serious weaknesses in Ingram's arguments for a young universe, I am not necessarily arguing for a chronology of billions of years. But I do not believe that to admit such a chronology, should conclusive evidence be forthcoming, would threaten my faith. As for the Word, it needs no defense; it is perfectly capable of taking care of itself.

Reference

- ¹Ingram T. Robert 1975. The theological necessity of a young universe, *Creation Research Society Quarterly*, 12 (1): 32-33.

Yours sincerely,

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