

Creation Research Society Quarterly

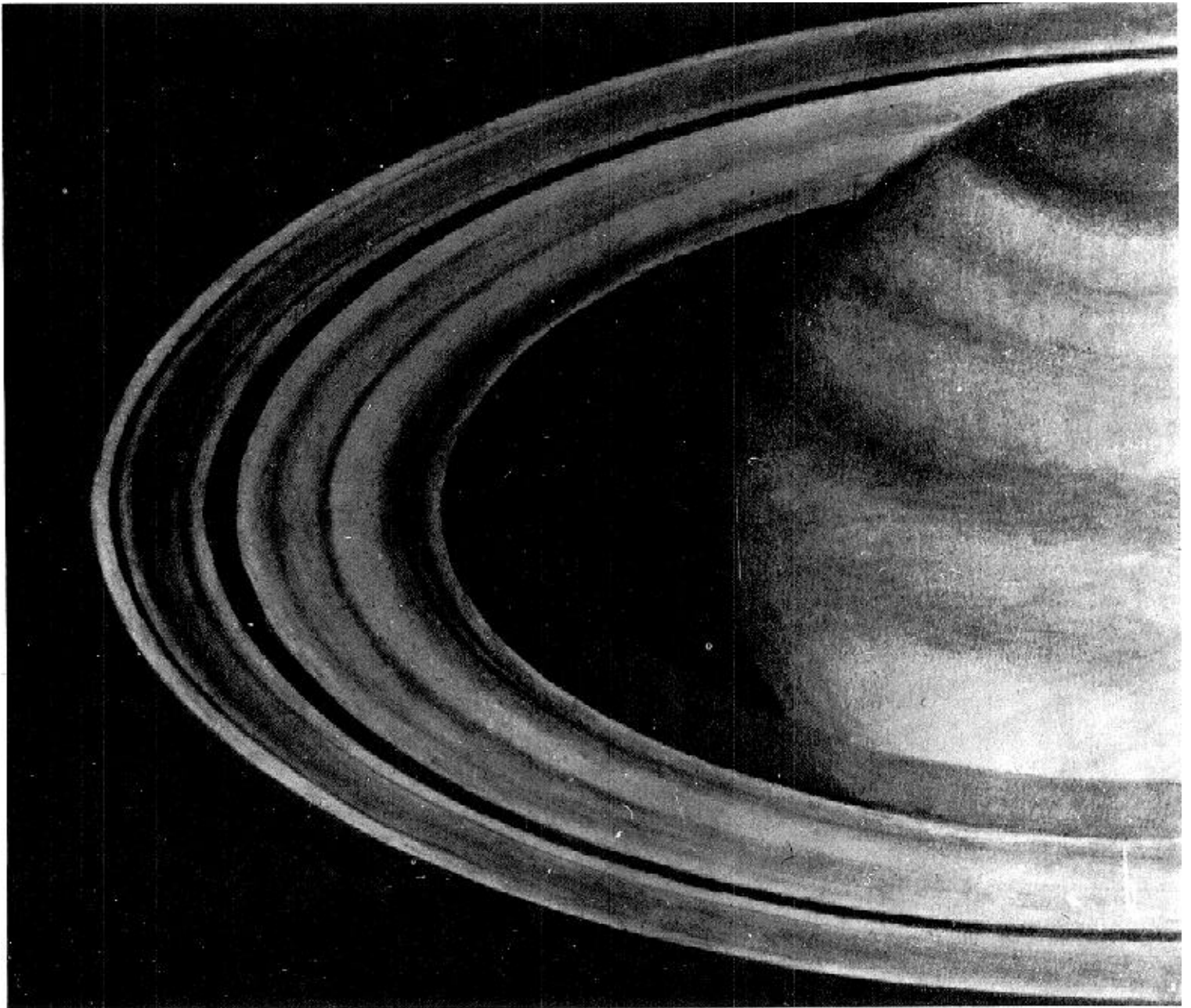
Haec credimus:

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

VOLUME 13

SEPTEMBER, 1976

NUMBER 2



CREATION RESEARCH SOCIETY QUARTERLY

Copyright 1976 © by Creation Research Society

VOLUME 13

SEPTEMBER, 1976

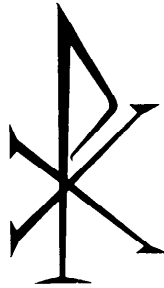
NUMBER 2

EDITORIAL BOARD

Harold L. Armstrong, Editor
4 Couper Street
Kingston, Ontario, Canada

Walter E. Lammerts, Research Editor

John N. Moore, Managing Editor
Department of Natural Science
136 Brody Hall, Michigan State University
East Lansing, Michigan 48824



Donald O. Acrey Geophysicist, Amarillo, Texas
Thomas G. Barnes. University of Texas at El Paso, Texas
Duane T. Gish. Institute for Creation Research,
San Diego, Calif.
George F. Howe. Los Angeles Baptist College,
Newhall, Calif.
John W. Klotz. Concordia Seminary, St. Louis, MO.
Henry M. Morris. Institute for Creation Research,
San Diego, Calif.
William J. Tinkle Anderson College (retired),
North Manchester, Indiana
John C. Whitcomb Grace Theological Seminary,
Winona Lake, Ind.
Emmett Williams Bob Jones University,
Greenville, S. Car.

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

Creation Research Society Quarterly is published by the Creation Research Society, 2717 Cranbrook Road, Ann Arbor, Michigan 48104. © 1976 by Creation Research Society.

COVER ILLUSTRATION

The front cover illustration shows Saturn and part of the rings. This picture is a photograph of a drawing, which B. Lyot made while he was observing at the Pic-du-Midi Observatory, France. The picture was first published in *l'Astronomie*, January 1953, as Figure 5, Plate 1, facing page 20. It later appeared in *Sky and Telescope*, page 207, April 1975. Permission to use this picture has been granted by the Observatoire de Paris, France. Also the Editors thank the Editor of *Sky and Telescope* for help in locating the picture.

The drawing was made under conditions of especially good viewing of Saturn, which happens only very occasionally. But under such conditions it is possible to distinguish detail which do not usually show up on a photograph. The many divisions and gradations in the rings are apparent.

Significance of these divisions in the rings is discussed in an article by William I. Thompson, III, elsewhere in this issue of the *Quarterly*.

See also the item about Saturn's rings in the "Panorama of Science" section in this issue.

TABLE OF CONTENTS

	Page
Which Animals Do Predators Really Eat? E. Norbert Smith	79
Catastrophic Origins for Asteroids and Rings of Saturn William I. Thompson, III	82
Experiments on Precipitation Brought about by Mixing Brines F. L. Wilcox and S. T. Davidson	87
The Ark-Shaped Formation in Tendurek Mountains of Eastern Turkey William H. Shea	90
The Elliptical Formation in Tendurek Mountains. Clifford H. Burdick	96
The Foetus As A Personality Sir William Liley	98
The Problem of Abortion David R. Nicholas and George F. Howe	103
Research Sponsored and Encouraged by C. R. S.	105
Biomagnetic Effects in Light of Formerly Stronger Geomagnetic Field Robert Vincent Hamby	106
An Examination of Theistic Evolution. H. L. Armstrong	108
Documentation of Absence of Transitional Forms John N. Moore	110
Fleeming Jenkin's Critique of Darwin's Origin of Species Hilbert R. Siegler	111
"Darwin's Mistake". Bolton Davidheiser	115
Probability and Missing Transitional Forms David J. Rodabaugh	116
Panorama of Science	119
Book Reviews	122
Film Strip Kit Review	123
Report of 1976 Board of Directors Meeting.	124
Letters to the Editor (3)	126

An Elementary Deduction

"... religion ... can be built up as an exact science by the reasoner. Our highest assurance of the goodness of Providence seems to me to rest in the flowers. All other things, our powers, our desires, our food, are really necessary for our existence in the first instance. But this rose is an extra. Its smell and its color are an embellishment of life, not a condition of it. It is only goodness which gives extra, and so I say again that we have much to hope from the flowers." Sherlock Holmes in the story, "The Naval Treaty".

WHICH ANIMALS DO PREDATORS REALLY EAT?

E. NORBERT SMITH*

Predators have been thought to serve prey species by removing the old, sick and maimed. This alleged selective elimination of the weak is central to the dogmas of natural selection and evolution. Recent evidence seems to indicate that random selection plays a major role in determining which animal is eaten. Further evidence indicates that at least under certain situations there is selection against the strong and healthy. Evolutionary (or anti-evolutionary) implications are obvious; and a critical reevaluation of the evidence is needed.

Introduction

Predators are viewed by evolutionists as providing a service to prey species by removing the very young, the old, sick and maimed. Instead of being detrimental to the prey species the predator, in selectively removing the inferior individuals, is considered important to the overall survival and supposed evolution of the prey.

The predator is also considered important to the survival of the prey by removal of the surplus. It is often said predators are necessary to keep prey population in control. Without predators it is maintained prey species would reproduce unchecked until the carrying capacity of the environment was exceeded, then catastrophically decline. The Kaibab Plateau incident is generally cited in support of the necessity of predators. Predators were removed from the Kaibab forest in northern Arizona in the early 1920's; and the deer population increased and subsequently died off.

This interpretation has been long since dismissed. According to Lauchkhart,¹ "Game men are now convinced that the removal of cougar from the Kaibab had nothing to do with the boom and burst of the deer herd. The deer increase apparently was the aftermath of some habitat changes."

Caughley² concluded little can be learned from the original deer population estimates of Rasmussen,³ except that a rise and decline occurred some time between 1924 and 1930. Burk⁴ dismissed the Kaibab incident as a long-persisting myth. Howard⁵ suggested "the deer-predation story should not be cited in future literature".

Many species have been found to regulate population density independent of predator effects. Pocket gopher density showed no correlation with coyote density fluctuations.⁶ Voles limited population density to available food resources without predators or climatic irregularities.⁷ Wynne-Edwards amassed extensive evidence for endogenous population density regulation⁸ and his evidence has been reviewed⁹ and evolutionary (or anti-evolutionary) implications discussed.¹⁰ Rodents, hares, and grouse were found to decrease when 22 species of predators were controlled.¹¹ Several laboratory studies have revealed reduced reproduction under crowded conditions.¹²⁻¹⁸

What Is Predator's Role?

What then is the role of the predator? From Darwin to the present time predators have been said to provide a filter, eliminating the inferior from the genetic pool. Supposedly through natural selection predators continually upgrade the breeding stock (and in turn are

genetically improved by the difficulty of feeding on an ever improving prey species) and provide the selective "force" for evolution. Predators are admitted to be important to evolutionary processes only if they differentially alter the gene pool. Random sampling of the prey species would not alter the gene frequency.

The concept of the weak, diseased and genetically unfit falling victim to the hunting predator is certainly plausible at first thought. Indeed, if unarmed man were the hunter he would of necessity kill the weak, slow or young. It is reasoned that the predator would save energy and be more assured of a meal if it sought the slow and weak. Surely the surviving genetically superior prey would have an advantage and due to that advantage continuing throughout geologic time should leave more progeny.

Evidence from nature, however, seems to indicate that luck plays a major part in determining which animal is eaten. Luck is not selective and could not alter gene frequency. The question, then, of which animals do predators really eat is of considerable importance, and has wide-ranging evolutionary (or, again, anti-evolutionary) implications.

Casual observations from hunting, trapping and fishing show that the vast majority of wild animals are usually healthy, vigorous, disease-free and have found enough to eat to show significant fat deposits. Where are the weak, the hungry—the food for predators? The often heard (but rarely confirmed) reply is that these animals have already fallen victim, and thus are no longer visible. Again the important question of whom predators eat has not been clearly answered.

Reports of Observations

While maintaining several species of snakes under laboratory conditions for over two decades, I have observed that snakes seem to prefer healthy active prey. If snakes are simultaneously offered two mice, one healthy, the other listless and ill, the snake will invariably select the healthy active mammal first. In fact, the ill mouse may remain unnoticed in a secluded corner for hours.

The following observations were made by veteran predator-trapper/biologist Roy McBride, and were gained through personal communication. McBride has 20 years experience trapping livestock predators in North and Central America and is currently studying radio tagged mountain lions in Texas. In the spring of 1972 he was attempting to capture a Grey Wolf (*Canis lupus baileyi*) in southwestern Durango, Mexico. The animal's tracks were easily recognized as the wolf was missing two toes from its front left foot.

*E. Norbert Smith, Ph.D., is with the Biology Department, Northeastern Oklahoma State University, Tahlequah, OK 74464.

The wolf was killing weaning-sized steers and heifers of the 300-500 pound size. The ranchers weaned all the calves at the same time; and many in the herd were young, weak and in poor health. These weak steers tired quickly and could be easily thrown by one cowboy. Of the 96 steers and heifers reportedly killed by the wolf, McBride personally examined 55 kills before capturing the wolf. Without exception the wolf was "selecting" the top healthy animals in spite of the abundance of weak prey. The young weak calves remained unharmed.

While following radio-tagged mountain lions McBride has seen a lion hunting deer (one can tell that they are hunting by stops at elevated points of lookout, in contrast to straight line non-hunting movement) actually walk out around a live deer entangled in a fence. Is not this reminiscent of a young dog or cat enjoying chasing a rodent only to ignore it when it becomes injured and falls motionless?

On another occasion four mule deer does were seen staying together on a hill near the Mexican border. A female mountain lion killed three of the four deer in a 90 day period, but left the fourth deer which was always with the other three deer. The fourth deer was in very poor condition due to a "shrivelled front leg". It is McBride's conclusion that predators "select" certain prey before the chase; and that with reasonably favorable conditions of weather cover and terrain they have no difficulty in taking healthy "top end" animals.¹⁹

A recent study reveals similar results regarding the snowshoe hare, *Lepus americanus*.²⁰ Causes of mortality were determined for radio-tagged animals by examining the carcass. Predation was the cause of mortality in 21 of 26 recorded deaths. Specific predators were identified in 15 of the 21 predator killed hares. Predators included lynx, coyote, weasel, horned owl, and goshawk.

Recent recapture data provided a condition index²¹ used to assess the physical condition of the predator-killed hares. Only one of the 21 predator-killed hares had a condition index value significantly below the mean value for survivors ($P < 0.05$). Again the evidence seems to indicate that predators are not preferentially removing the weak and unhealthy.

The available evidence, at least for certain predators under some conditions, indicates predators are fully capable of capturing healthy "top of the line" prey; and that chance determines which animal is eaten. In fact, the evidence seems to indicate that the sick and weak are preferentially avoided.

Implications Examined

Upon closer examination does not this seem both logical and adaptive? The weak, slow prey is often suffering from an infectious disease. Any predator preying on these individuals would risk infection. Many viral and bacterial infections can be transmitted by contact, or through the nasal or buccal mucosa. Many endoparasites enter a host via the gastrointestinal tract.

It would seem that avoidance of the slow prey individuals would be adaptive by minimizing exposure to communicable diseases and parasites. Animals weak from undernutrition and or malnutrition are often more

susceptible to disease and it would again seem mal-adaptable to select for these animals. It might also be mentioned that healthy prey would always provide a better meal both quantitatively and qualitatively.

Methods employed by predators also fail to indicate a positive selection for the unhealthy, weak, or listless individuals. Many predators are opportunistic and build traps (ant lions, web building spiders) or lie in ambush (many insects and reptiles). These animals simply take what individual happens to come along. No active selection for the less fit occurs; in fact, it would seem the opposite is true. The animals taken are the healthy individuals that are out foraging for food.

To the predators that actually hunt prey vision is often important. Animals responding to visual cues are often profoundly sensitive to the slightest movement. Once spotted, the healthiest of prey can usually be captured. In fact, the listless slow prey remain unnoticed in the protection of their burrow or naturally occurring cover.

Again there is no evidence that the healthy animals are preferentially avoided. In fact the opposite appears to be true, especially among mammalian carnivores. They seem to enjoy the chase, fight and kill. Dogs that learn the excitement of chasing and killing livestock often can be "cured" only by destruction. Many predators seem to enjoy the chase that only a healthy animal can provide. In fact, animals that refuse to run seem to confuse and frustrate predators.

The widespread occurrence of death fraying seems to substantiate this deduction. If predators are simply looking for an easy meal, death fraying would seem the worst possible behavioral response to attack; yet many animals do just that. Many insects, isopods, spiders, amphibians, and reptiles remain motionless when disturbed. A common example occurs when a dog finds a box turtle or hognosed snake. In both cases the dog will energetically "attack" the reptile only to lose interest quickly when the new-found prey fails to run.

The death fraying response is so well developed in certain marsupials that the expression "playing possum" is a part of everyday language. The opossum has a highly specialized physiological response that enables it actually to "faint" under stress. Large capillary beds vasodilate, blood pressure drops, and the animal loses consciousness. How can this possibly be protection from a predator that is hunting the "weak and slow"? This response is seen as adaptive only if the predator is searching for active animals. In fact, the chase seems to be an important prelude to the kill. Animals that remain motionless when attacked escape not by becoming invisible to the predator but by confusing the normal find-chase-kill sequence.

Predators that were capable of overpowering only unhealthy, weak or old prey would not be able to survive long in nature. Trapping data and field observations reveal only a very small proportion of most prey species are in poor condition. Most predators have considerable over-kill ability. Many carnivore mammals and predatory reptiles can easily out-run (or ambush), overpower, and kill animals many times their size and weight. Consider a 60 pound wolf downing a 400 pound steer or the potency of venomous snakes.

A parallel argument exists regarding herbivores. Although most plant-eating animals select the species eaten there is little evidence for selection of the genetically inferior members of the plant population. Of course, other factors such as intraspecific competition, seed production, germination, etc., are said to play a major role in plant selection. It would seem that at least in heavily grazed grasslands a situation parallel to the predator-prey examples exists; yet apparently there is no significant selection of the "less fit". In fact, many herbivores seem to select preferentially the tall lush plants. Again many of the same arguments apply with regards to relative nutritional value. Certainly negative selection is working among herbivores.

Summary

In summary, evidence and logic clearly indicate many predators are quite capable of catching and often prefer to catch healthy "top of the line" prey. Random selection plays a significant role in determining which animal is eaten. The evolutionary (or anti-evolutionary) implications are widespread and obvious. Predators have long been thought necessary to maintain population density of prey species and to provide the mechanism for improvement of prey gene pool by selectively eliminating the inferior individuals. Both aspects of predator-prey relation permeate much of modern evolutionary dogma.

If, then, fecund individuals are not selected for, and if predators (or herbivores) do not selectively harvest phenotypically inferior individuals, natural selection is a dogma without a mechanism. Clearly a critical re-evaluation of the facts is warranted, and, indeed, needed.

References

- ¹Lauckhart, J. B. 1961. Predator management. 41st Annual Conference Western Association of State Game and Fish Commissioners, Santa Fe, New Mexico.
- ²Caughley, 1970. Eruption of ungulate populations, with emphasis on Himalayan thar in New Zealand, *Ecology* 51(1):53-72.
- ³Rasmussen, D. I. 1941. Biotic communities of Kaibab Plateau, Arizona, *Ecological Monographs* 11(3):229-275.
- ⁴Burk, C. J. 1973. The Kaibab deer incident: A long-persisting myth, *Bio-Science* 23(2):113-114.
- ⁵Howard, W. E. 1974. The Biology of Predator Control. Addison-Wesley Module in Biology No. 11. Addison-Wesley Publishing Company, Inc.
- ⁶Robinson, W. B. and T. V. Harris. 1960. Of gophers and coyotes, *American Cattle Producer*, October, No. 22, 2 pp.
- ⁷Chitty, D. 1960. Population processes in the vole and their relevance to general theory, *Canadian Journal of Zoology* 38(1):99-113.
- ⁸Wynne-Edwards, V. C. 1962. Animal dispersion in relation to social behavior. Hafner Publishing Company, New York.
- ⁹Smith, E. Norbert. 1969. Book Review. *Creation Research Society Quarterly* 6(1):73-74.
- ¹⁰Smith, E. Norbert. 1970. Population control: Evidence of a perfect creation, *Creation Research Society Quarterly* 7(2):91-96.
- ¹¹Crissey, W. F. and R. W. Darrow. 1949. A study of predator control on Valcour Island. New York State Conservation Department, Division of Fish and Game, Research Series 1, 28 pp.
- ¹²Crew, F. A. E., and L. Mirskaia. 1931. The effects of density on an adult mouse population, *Biological Genetics* 7, 239-250.
- ¹³Pearl, R. 1932. The influence of density of population upon egg production in *Drosophila melanogaster*, *Journal of Experimental Zoology* 63(1):57-84.
- ¹⁴Roth, L. M. and R. B. Hawland. 1941. Studies on the gaseous secretion of *Tribolium confusum* L. Abnormalities produced . . . by exposure to a secretion given off by the adults, *Annals of Entomological Society of America* 34, 151-172.
- ¹⁵Allee, W. C., A. E. Emerson, O. Park, T. Park and K. P. Schmidt. 1949. Principles of animal ecology. W. B. Saunders Co., 218 W. Washington Square, Philadelphia, Pennsylvania 19105. Chapters 18-22.
- ¹⁶Silliman, R. P., and J. S. Gutsell. 1958. Experimental exploitation of fish populations. *U. S. Fish and Wildlife Service Fishery Bulletin* 58 (no. 133) 214-52.
- ¹⁷Best, J. B., A. B. Goodman and A. Pigeon. 1969. Fissioning in planarians: control by the brain, *Science* 164 (3879):565-566.
- ¹⁸Smith, E. Norbert. 1973. Crowding and sexual reproduction of the planaria *Dugesia dorotocephala*, *Creation Research Society Quarterly* 10(1):3-10.
- ¹⁹McBride, R. 1976. Status and ecology of the mountain lion (*Felis concolor stanleyana*) of the Texas and Mexico border. Master's Thesis, Sol Ross University, Alpre, Texas.
- ²⁰Brand, C. J., R. H. Vowles and L. B. Keith. 1975. Snowshoe hare mortality monitored by telemetry, *Journal of Wildlife Management* 39(4):741-747.
- ²¹Bailey, J. A. 1968. A weight-length relationship for evaluating physical condition of cottontails, *Journal of Wildlife Management* 32(4): 835-841.

Design in Inorganic Nature

Many writers have pointed out the obvious good design to be seen in living beings, in that the parts are adapted to the whole, and the whole to the being's way of life. The high point, perhaps, of such studies is Paley's Natural Theology.

Later, Darwin and others attempted to destroy the force of such evidence of the work of a Designer. They argued that all of the adaption was to be ascribed to chance and to natural selection. Later the "chance" became somewhat more specific, as mutations.

Creationists have replied that all mutations are harmful, that variability is limited, and that the alleged natural selection would not be effective anyway.

Another example of adaption is to be found in the inorganic world. The Earth is obviously adapted to be the home of living beings. It is right in such respects as chemical composition, the presence of water, the temperature, the lengths of day and night, and of the year, and in many other features. Clearly, this suitability can not be ascribed to survival on the part of the Earth. Nobody believes that many (proto-) Earths once came about, and that the one which was suitable as a home for living beings survived.

Evolutionists, then, try another argument. They say that the suitability proves nothing; for if the Earth were not suitable for living beings we should not be here to notice the fact. (Continued on page 86)

CATASTROPHIC ORIGINS FOR THE ASTEROIDS AND THE RINGS OF SATURN

WILLIAM I. THOMPSON, III*

This paper describes new information which point out the superiority of a catastrophic theory for the origin of the asteroids and the rings of Saturn to that of the nebular condensation theory currently in vogue.

Introduction

Two long-standing problems in astronomy are the questions of the origins of the asteroids and the rings of Saturn. The two dynamic systems have several similarities and are often treated together in the literature as will be done here. Similarities include: (1) both are entities in the solar system; (2) both are composed of myriads of individual particles; and (3) both have a marked spatial (temporal) structure.

Differences include the facts that: (1) the asteroids do not lie in a plane as do the rings of Saturn; (2) the asteroids do not presently lie within the Roche limit of an astronomical body as do the rings of Saturn, and (3) the compositions and size distribution of the particles in the two systems differ. (See Table 1)

The basic purpose of this paper is to show how a catastrophic theory of origin is preferred to the nebular condensation theory for the formation of these two systems. Catastrophism is the doctrine that objects in the solar system (and the universe), including planet Earth, have experienced sudden, overwhelming physical events in the past. The nebular condensation theories generally accepted today involve uniformitarianism, which is a doctrine in geology that existing processes acting in the same manner as at present are sufficient to account for all geological changes. Thus catastrophism and uniformitarianism are contradictory.

Asteroid Origin

The asteroids are irregular chunks of rock strung out between the planets Mars and Jupiter. The rock fragments have diameters ranging from fractions of a kilometer (km) to nearly 800 km and have been found to vary widely in composition.¹ Studies of asteroids and meteorites have led many scientists to postulate that many of the meteorites come from asteroids. This led Bronshten² to discuss the disintegration of a hypothetical planet Phaeton³ in which iron-nickel meteorites were fragments of the nucleus, iron-stone meteorites were fragments of the middle layer, and stone meteorites were fragments of the mantle of the exploded planet.

The idea that the asteroids might be fragments of an exploded planet was first put forward by Olbers more than 150 years ago.⁴ In recent years this view has become somewhat unfashionable but the idea has been revived independently by both Ovenden⁵ (1973) and Woolfson⁶ (1971). Their ideas have been detailed by Dormand and Woolfson.⁷ Basically, Ovenden⁸ (1974) has developed a principle of least interaction action and applied it to the planetary system of the sun. The principle requires that there was once a planet of mass approximately 90 times the earth's mass in the asteroid

Table 1. Comparison Between the Asteroids and the Rings of Saturn.

PARAMETER	ASTEROIDS	SATURN'S RINGS
Spatial (Temporal) Structure	yes (Figure 1a)	yes (Figure 1b)
In Equatorial Plane of the Sun?	no	no
Median Inclination to Ecliptic	8.6°	~26°
In Equatorial Plane of a Planet?	no	yes, Saturn's
Outer Scale Size of Orbits	1.5×10^9 km	2.7×10^5 km
Within the Roche Limit of an Astral Body?	not at present time	yes, Saturn's
Mass of System	1.7×10^{22} g	$< 5.6 \times 10^{22}$ g
Thickness of System	not well defined	10 km
Median Period	4.6 years (4.0×10^4 hrs)	~ 8 hrs
Particle Properties		
Size Range	dust size to 960 km	mean dia. = 1 cm
Size Distribution	power law	?
Composition	rocky	icy
Number	$> 10^6$	myriads
Density (Probable)	3.5 g cm^{-3}	1.0 g cm^{-3}

belt, which "disappeared" relatively recently in the history of the solar system.

There have been many associated papers and discussions on these papers but suffice it to say there is a catastrophic aspect in the theories of both Ovenden and Woolfson.

Patten et al.⁹ discuss the problem of the origin of the asteroids and postulate a "fifth planet" named Electra after the Greek tradition. They detail how the planet Mars, in a slightly different orbit from the present-day one, came within the Roche limit of the planet Electra and gravitationally destroyed the smaller Electra. They propose further that, subsequently, some of the debris became: moons of Mars of which only two large ones still exist, i.e. Phobos and Deimos; the asteroids; and the four outer moons of Jupiter. These authors also discuss possible subsequent meteorite falls on the Earth and the Moon and Mars, which, they postulate, occurred in historical times.

Asteroid Orbit Distribution

In Figure 1a the frequency distribution of orbit sizes for 1,563 asteroids is plotted with the upper scale showing the corresponding mean daily motions. Fractions mark commensurabilities¹⁰ between the mean daily motion of the asteroids and of Jupiter. These fractions tend to match dips in the curve (the so-called Kirkwood gaps). The Trojan asteroids (1/1 commensurability) have semimajor axes close to Jupiter's 5.2 astronomical units.

*William I. Thompson, III holds the degree M. S. in astrogeophysics. He receives mail at 62 Elmwood St., Millbury, MA 01527.

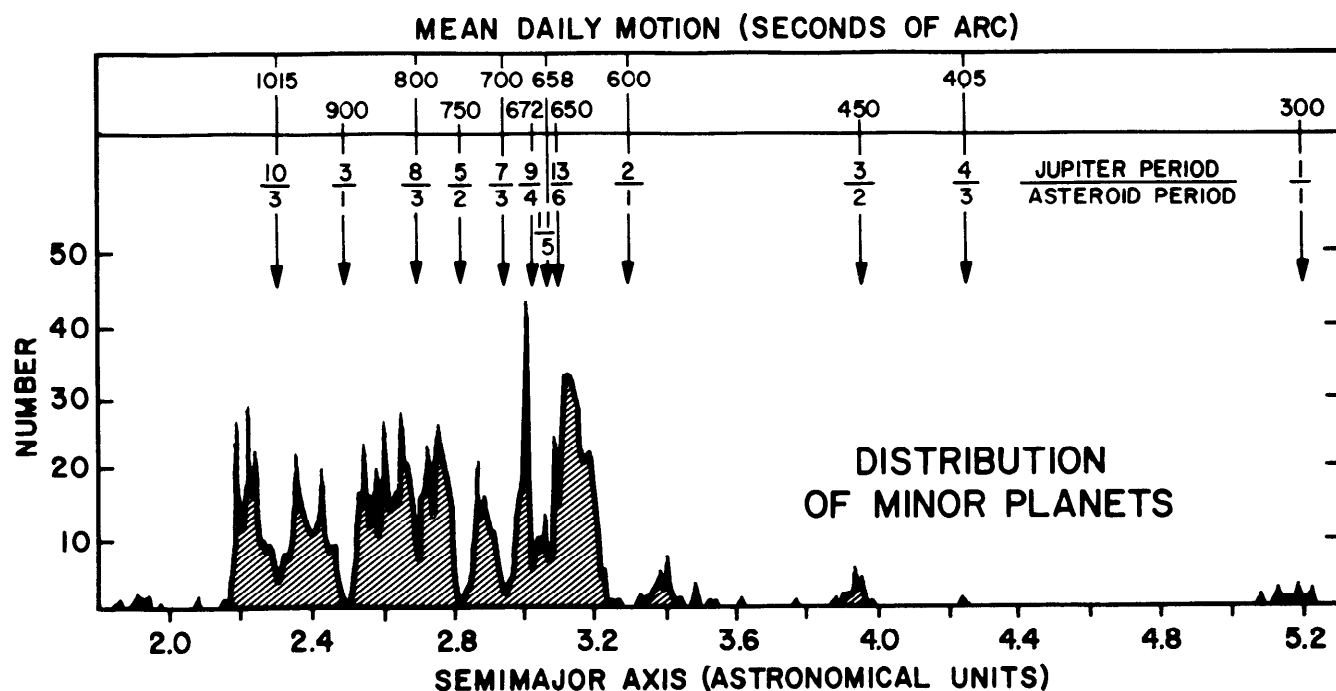


Figure 1a. Distribution of the asteroids (From *Sky and Telescope*, February 1974, p. 94, Courtesy of Yale University Observatory).

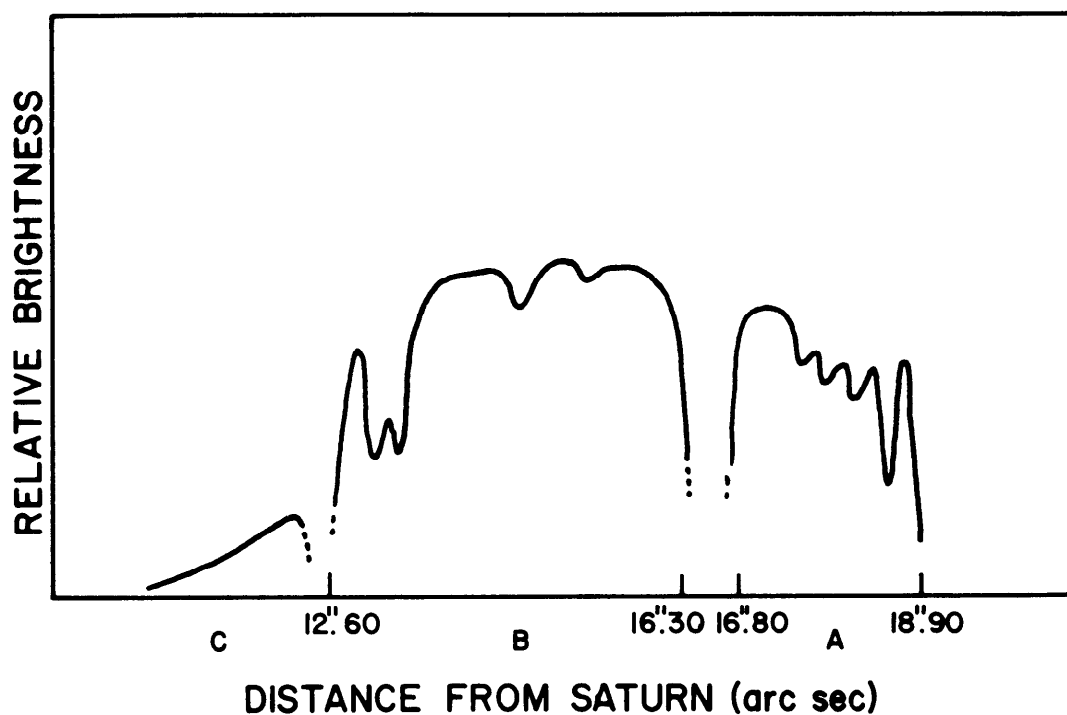


Figure 1b. Relative Photometric intensity of the rings of Saturn (After Dollfus). Angular distances given for Saturn at 10 Astronomical Units (From *Planetary and Space Science* 15, 53, Reprinted with permission of Pergamon Press Ltd.).

The clusters and gaps caused in the asteroids by Jupiter are not visually apparent, as they are in Saturn's rings (See cover illustration). This is because of the small number of asteroids with calculated orbits, and the considerable variation in eccentricity and tilt of the asteroid orbits. But the gaps or clusters become apparent when considering the distribution of the mean motions of the asteroids about the Sun, as is shown in Figure 1a.

In a recent Ph.D. thesis Wiesel¹¹ made a statistical study of the Kirkwood gaps in the asteroid belt (and also gaps in Saturn's rings). He found that there are no asteroids with periods which are a simple, rational multiple of the period of Jupiter. Wiesel's conclusions include the following:

To date we have seen conclusive evidence that the pure statistical theory developed in this work is simply not capable of reproducing the type of gap seen in the real asteroid belt, or for that matter, in the rings of Saturn. (p. 153)

... some mechanism, possibly collisions, has eliminated almost all of the librators¹² that *must* once *have existed* from the viewpoint of the nebular condensation theories of the formation of the solar system. (p. 84. Emphasis added)

... some additional mechanism *must have* operated either now or in the past to change the assumed gapless initial distribution into the presently observed situation. (p. 153. Emphasis added)

Nowhere in the thesis is any mention made of a "fifth planet" hypothesis or of the work of such researchers as Reiffenstein¹³ and Lumme¹⁴ who propose catastrophic origins of the rings of Saturn. Note the terms such as "must have existed", or "assumed gapless initial distribution". There may now be good reason against assuming an initial gapless distribution, if the catastrophic theory of origin is taken seriously.

In summary, the asteroids, with irregular shape, manifold compositions, and varying sizes, could have come about from the breakup of a planetary-sized body. In fact, in a recent article on asteroid collisional evolution, Chapman and Davis¹⁵ state that the present asteroids are a mere remnant of a much larger earlier population of planetesimals totaling a small planetary mass.

They state that the potential planet (nebular condensation theory) was interrupted in the process of accreting in the asteroid zone. Perhaps subsequent and continuing fragmentation generated the largest source of material during later epochs of solar system history for cratering and accreting on planetary bodies.¹⁶ These conclusions might be said of a "fifth planet" hypothesis; and this climate of opinion is indicative of real progress in the asteroid origin problem.

Saturn's Rings

Saturn is the second-largest planet in the solar system and the sixth in the order of distance from the Sun. The most remarkable feature of Saturn's system is the rings surrounding it. The ring system is divided into four main regions, designated A, B, C, and D.¹⁷ The cover illustration of this issue shows the divisions, Table 2 gives specific dimensions and Figure 1b shows the photometric brightness variations across the rings.

Table 2. Dimensions of Saturn's Rings and Appropriate Satellites.^a

Parameter	Value (km)	SATURN	
		Saturn Radii	Commensurabilities of Periods
Equatorial radius of Saturn	60,000 ± 240	1.00	
Outer edge of ring D	72,600 ± 2,000	1.21	
<i>Guerin division</i>	width about 4,200	—	Approx. X/4; I/6; II/8
Inner edge of ring C	76,800 ± 2,000	1.28	
Outer edge of ring C	88,800	1.48	
unnamed division	width about 960	—	X/3
Inner edge of ring B	92,000 ± 850	1.53	
Outer edge of ring B	117,800 ± 350	1.96	
<i>Cassini division</i>	width about 2,600	—	X/2; I/3; II/4
Inner edge of ring A	120,400 ± 400	2.01	
<i>Encke division</i>	a marking	—	(3/5)X
Outer edge of ring A	136,450 ± 350	2.28	
Roche limit	146,400 ± 240	2.44	
Semimajor axis of orbit of Janus X	168,700	2.81	X/1
Semimajor axis of orbit of Mimas I	185,600	3.09	I/1
Semimajor axis of orbit of Enceladus II	239,700	4.00	II/1

^aAdapted from a table in *Space Science Review* 3, 179-271.

The outer ring A, of moderate brightness, has an outside diameter of 272,900 km and an inner diameter of 240,800 km. It is separated from ring B by the dark Cassini division, which is 2600 km wide. Ring B, which is very bright, has an outer diameter of 235,600 km and an inner diameter of 184,000 km. It is slightly less bright in its inner regions and may be separated from ring C by a narrow dark division, perhaps 960 km wide.

Ring C, which is sometimes called the "crape" ring, is much fainter and semitransparent; it appears as a dark band in projection against the disk of the planet and as a faint dusky band against the sky. The outer diameter of ring C is 177,600 km. The inner edge is only 16,800 km above the surface of the planet at the equator.

Additional divisions have been noted in the rings by some observers, but others doubt their reality, however—see the picture on the cover. The Encke division, which marks the limit between the outer darker zone and the inner brighter zone of ring A, is more nearly a line of minimum brightness than a dark division. A fourth zone, D, of the rings of Saturn, between C and the globe, was discovered by P. Guerin at Pic-du-Midi Observatory in October, 1969. It is separated from C by a dark division similar to Cassini's; and the brightness is not more than 6% of ring B.

Both theory and observations prove that the ring system is made up of myriads of separate particles which move independently in circular coplanar orbits in the equatorial plane of Saturn. The visibility of the globe of Saturn through ring C, and to a small extent through ring A, the incomplete disappearance of the satellites when in the shadows of these rings, and the visibility of stars shining through them, prove that at least rings A and C are relatively transparent.

Photometric observations of the variation of brightness of the ring, as a function of phase angle (up to its maximum value of 6°), also show that the particles are

rather far apart. Perhaps the particles occupy not more than a few percent of the volume of rings A and B, and a much smaller fraction in rings C and D.

The discontinuous, meteoric nature of the rings is also demonstrated directly by spectroscopic observations, which show that the inner edge of the ring rotates faster than the outer edge, and precisely with the velocities that independent satellites would have at the same distances from the planet.

The origin and nature of Saturn's rings was first proposed by E. Roche¹⁸ in 1847 and by J. C. Maxwell¹⁹ in 1856. Roche established that a satellite of a planet of the same density cannot form, because of destructive tidal forces, at a place closer to the planet than 2.44 times the radius of the planet. Stated another way, any astronomical body that is larger than approximately 200 km in diameter will break-up within this Roche limit.²⁰⁻²²

The outer edge of Saturn's rings is at 2.28 radii, inside Roche's limit, whereas the nearest satellite, Janus, is at a semimajor axis of 2.81 outside the limit.

Maxwell proved, further, that a ring system of small mass formed of a large number of independent particles is fairly stable against external perturbations such as those caused by the larger satellites. The aggregate mass of the ring system is very small, probably much less than one-quarter the mass of the Moon. Periodic perturbations by the major satellites are, however, usually considered responsible for the main divisions of Saturn's ring in the same way that perturbations by Jupiter cause the Kirkwood gaps in the asteroid belt. However, as mentioned already, the theory is really not developed yet. This could be an interesting research project.

The radius of Cassini's division between rings A and B corresponds to a revolution period equal respectively, to $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ of the revolution periods of the first three satellites; the limit or gap between rings B and C corresponds to a revolution period equal to $\frac{1}{3}$ of that of the first satellite and the Encke division in ring A to $\frac{3}{5}$ of the same period. The division between ring C and ring D has nearly $\frac{1}{2}$ the rotation period of Cassini's division. While it seems that the periodic oscillations of the satellites of Saturn play some role in the shaping of the ring system it obviously is not the only mechanism (See previous discussion of asteroid orbit distribution). For example, Reiffenstein¹³ would have the Cassini division formed by breaking up two satellites within Roche's limit, which thus formed two rings.

Presence of Water and Icy Bodies

The inner, regular satellites of Saturn all appear to be snowballs composed primarily of ices of H_2O (water), and ammonia. Pilcher et al.²³ and Kuiper et al.²⁴ both identified water frost in the spectrum of Saturn's rings. It seems to be the major constituent.

Morrison,²⁵ moreover, reported on the anomalously low densities of some of the inner moons of Saturn. He found that the densities of each of these satellites is less than 1.5 g/cm^3 and that in the case of Mimas, it may well be as low as 1.0 g/cm^3 . By way of comparison, water has a liquid density of 1.0 g/cm^3 , and ice about 0.9 g/cm^3 . If these conclusions are correct, these satellites appear to comprise a previously unrecognized class

of objects in the solar system that are hundreds of kilometers in diameter but composed almost entirely of low density ices.

Furthermore, there appear to be many icy bodies in the universe and in the solar system in particular.²⁷⁻²⁹ The following conclusions seem obvious:

(1) Roche's limit (modified slightly) is applicable to Reiffenstein's model.²²

(2) Low density, liquid water satellites are theoretically possible.^{27, 28, 29}

(3) There are many icy bodies in the vicinity of Saturn with densities around 0.95 g/cm^3 and several hundred kilometers in diameter, as postulated by Reiffenstein¹³ and measured by Morrison.²⁵

(4) The rings of Saturn are primarily composed of water ice.^{23, 24}

Thus, the above conclusions are in quite close agreement with the satellite breakup model proposed by Reiffenstein, in particular, with regard to the density of his satellite A with a postulated density of 0.95 g/cm^3 and an original diameter of 1721 km. Thus, a catastrophic type model seems to be in agreement with the observational facts and should be seriously considered as a possibility for the origin of the rings of Saturn.³⁰

Discussion

It now seems that several different mechanisms were at work in the formation of the asteroid belt and the rings of Saturn. The initial mechanism in each case could well have been the catastrophic gravitational break-up of an astronomical body: (a) in the case of the asteroids, a rocky planet; and (b) in the case of Saturn's rings, an icy satellite (or inter-galactic astral body) containing large quantities of liquid water and ice.

Additional mechanisms for the formation and evolution of the asteroid belts may well be collisions as postulated by Chapman and Davis¹⁵ and secular resonances postulated by Wiesel¹¹ and others. The theory as developed by Wiesel is accurate from an initial assumed gapless distribution to 50%. Possibly with different initial conditions these mechanisms can be shown to work and even on a different time scale than the always assumed 4.5 billion years.

In the case of Saturn's rings the presently available statistical theory is inadequate to describe the present situation as Wiesel¹¹ has stated,

The case of Saturn's rings is particularly interesting, since the width of the observed gaps is some *orders of magnitude* too large according to the present statistical theory, instead of the approximately 50% discrepancy in the Sun-Jupiter system. (p. 162, Emphasis added)

This paper has shown that there is adequate evidence to suggest an initial condition which allowed the break-up of an astronomical icy body which would create many mini-satellites around Saturn. Then secular resonances could be provided by the gravitational influences of the inner satellites of Saturn as well as by a hypothetical longitude-dependent part of Saturn's gravitational field as discussed by Allan.³¹

An additional factor which should be considered is the motion of the solar system in the galaxy in a huge helical path. Possibly part of the dynamical information is being missed by neglecting this motion in formu-

lating a creationist view of the universe. Munzenrider³² discusses this point which could usher in a whole new comprehension of dynamical astronomy.

In conclusion, Table 1 presented a brief comparison between the two dynamical systems: the asteroids and the rings of Saturn. In viewing the table I am impressed with the differences in the two systems. It could be that the problems should not be treated together and that each has a unique solution. It is hoped that this present paper will shed some light on the ultimate solution.

(Editor's Note: It may be remarked that consideration of catastrophic events is appropriate in a journal dedicated to Creation, for both Creation and catastrophe are antitheses of slow, uniform development. In deed, in many cases it would not be possible, by studying the situation after the event, to say whether it came about by sudden Creation or by a catastrophic event; but it would be apparent that it did not come about by slow, uniform evolution.)

Besides, most creationists have reason to think about one catastrophe: the Flood. And there might have been catastrophes in the heavens, as well as on Earth, unless maybe Haggai 2:6 means that catastrophes in the heavens are yet to come.)

References and Notes

- ¹Chapman, C. R. and D. Morrison 1974. The minor planets: sizes and mineralogy, *Sky and Telescope* 47(2):92-95.
- ²Bronshen, V. A. 1971. Origin of the asteroids, English Translation from Zemlya Vseleennaya (USSR), Sept.-Oct., pp. 53-59, Report No. NASA-TT-F 14266, National Technical Information Service, Springfield, VA, Accession No. N72-24856.
- ³Zigel, F. Yu. 1969. *The Minor Planets*, English Translation of Malye Planety, Nauka Press, Moscow, NTIS N72-24873.
- ⁴Napier, W. McD. and R. J. Dodd 1973. The missing planet, *Nature* 242(5395):250-251.
- ⁵Ovenden, M. W. 1973. Planetary distances and the missing planet (in) *Recent Advances in Dynamical Astronomy*, Reidel, Boston, pp. 319-332.
- ⁶Woolfson, M. W. 1971. The origin of planetary systems, *Physics Bulletin* 22, 266-272.
- ⁷Dormand, J. R. and M. M. Woolfson 1974. The evolution of planetary orbits, *Proceedings of the Royal Society of London* A340(1622): 349-365.
- ⁸Ovenden, M. W. 1974. The principle of least interaction action, p. 489 (in) *Highlights of Astronomy*, IAU Symp., G. Contopoulos, Editor, Reidel, Boston, p. 489.
- ⁹Patten, D. W., R. R. Hatch, and L. C. Steinhauer 1973. *The Long Day of Joshua & Six Other Catastrophes*, Pacific Meridian, Seattle.
- ¹⁰Commensurable means that two quantities are divisible by a common unit an integral number of times. These are also known as resonances of which there are many known in the solar system.
- ¹¹Wiesel, W. E. 1974. A statistical theory of the Kirkwood gaps. Ph.D. thesis, Dept. of Astronomy, Harvard University, Cambridge, Massachusetts.
- ¹²Libration is an oscillation in the apparent aspect of a secondary body (as a planet or a satellite) as seen from the primary object around which it revolves. See Patten et al.⁹ for details.
- ¹³Reiffenstein, J. M. 1968. On the formation of the rings of Saturn, *Planetary and Space Science* 16(12):1511-1524.
- ¹⁴Lumme, K. 1972. On the formation of Saturn's rings, *Astrophysics and Space Science* 15(3):404-414.
- ¹⁵Chapman, C. R. and D. D. Davis 1975. Asteroid collisional evolution: evidence for a much larger earlier population, *Science* 190 (4214):553-556.
- ¹⁶Chapman and Davis¹⁵ discuss the possible cratering effects on the inner planets of the solar system caused by the asteroids. Patten et al.⁹ also consider the same cratering effects with a greatly reduced time scale. Details on the cratering events may be found in references 21-25 of Chapman and Davis¹⁵.
- ¹⁷de Vaucouleurs, G. 1971. Saturn (in) *McGraw-Hill Encyclopedia of Science & Technology*, McGraw-Hill, New York.
- ¹⁸Roche, E. 1847. La figure d'une masse fluide, *Acad. Sci. Lett. Montpellier* 1, 243-262.
- ¹⁹Maxwell, J. C. 1856. On the stability of the motion of Saturn's rings (in) *The Scientific Papers of James Clerk Maxwell*, W. D. Niven, Editor, Dover, New York, pp. 288-376.
- ²⁰Steinhauer, L. C. 1971. The relevancy of Roche's limit to the flood-ice dump theory, *Creation Research Society Quarterly* 8(1):63-65.
- ²¹Steinhauer, L. C. 1972. Out of whose womb came the ice? Job 38: 29 (in) *A Symposium on Creation, IV*, Baker Book House, Grand Rapids, pp. 134-147.
- ²²Aggarwal, H. R. and V. R. Oberbeck 1974. Roche limit of a solid body, *Astrophysical Journal* 191(3):577-588.
- ²³Pilcher, C. B., C. R. Chapman, L. A. Lebofsky and H. H. Keiffer 1970. Saturn's rings: identification of water frost, *Science* 167 (3923):1372-1373.
- ²⁴Kuiper, G. P., D. P. Cruikshank and U. Fink 1970. The composition of Saturn's rings, *Sky and Telescope* 39(1):14.
- ²⁵Morrison, D. 1974. Albedos and densities of the inner satellites of Saturn, *Icarus* 22(1):51-56.
- ²⁶Owen, T. 1973. Ice in astronomy (in) *Physics & Chemistry of Ice*, E. Whalley et al., Editors, Royal Society of Canada, Ottawa, Ontario, Canada, pp. 117-126.
- ²⁷Lewis, J. S. 1971. Satellites of the outer planets, *Icarus* 15(2):174-185.
- ²⁸Lewis, J. S. 1973. Chemistry of the outer solar system, *Space Science Review* 14(3/4):401-411.
- ²⁹Consolmagno, G. 1975. Thermal history of icy satellites. M. S. Thesis, Massachusetts Institute of Technology, Cambridge, Massachusetts.
- ³⁰The present author is of the opinion also that the icy satellite or astral body may have come from regions outside the immediate solar system. There is no law of astronomy that states that all events in the solar system have to have been caused by solar system objects.
- ³¹Allan, R. R. 1967. Resonance effects due to the longitude dependence of the gravitational field of a rotating primary, *Planetary and Space Science* 15(1):53-76.
- ³²Munzenrider, J. P. 1971. A new antithesis, *The Fibonacci Quarterly* 9(2):163-176.

Design in Inorganic Nature

(Continued from page 81)

Of course, that statement is true. But it is nothing to the point, for the evolutionists' purpose.

To see why not, consider an analogous case. Suppose that one, standing by the road, were to remark that the automobiles going by are obviously designed to travel. (Which, of course, everyone knows is true.) Suppose, though, that a companion were to object: "Not at all. If they were not able to travel, we should not see them going by". Again, that objection is true, as a simple statement, but it is not to the point. For the reply is:

But in fact they are going by. So they are able to travel; and the reason that they are able is because

they were designed to do so. The fact that badly designed ones would not be able to travel proves nothing; for we see some which are able to travel, and hence we conclude that they were designed for that purpose.

Is it not the same case with The Earth? About hypothetical Earths which would have been unsuitable for living beings one knows nothing; but he does know that this Earth which is inhabited is suitable. And the suitability implies intelligent, purposeful, design, an activity which, in the present context, is called Creation.

— Editor Armstrong

EXPERIMENTS ON PRECIPITATION BROUGHT ABOUT BY MIXING BRINES

F. L. WILCOX* AND S. T. DAVIDSON†

The authors describe some experiments in which precipitation of sodium chloride is brought about by the mixing of originally saturated solutions of the materials concerned. Such precipitation might have played a part in the formation of great beds of evaporites which are found in rocks. This possibility is of interest to those who believe in a young Earth, for a Biblical chronology may not leave time for beds of salt to have been formed by slow evaporation.

The Problem

The presence of great beds of rock salt, or of similar minerals such as calcium carbonate, presents a problem to those who believe in a young Earth. But it is by no means true that these deposits are accounted for any better by those who hold uniformitarian views.

These minerals are often called evaporites, since it has been supposed that they arose by the evaporation of sea water, or some similar brine. But it is not easy to find any place where such evaporation is going on to any considerable extent today. So once again the present is *not* the key to the past.

There are other problems. The predominant mineral in sea water, or in the water of salt lakes, is common salt. How, then, did other minerals, such as magnesium chloride, become segregated? Also, if these beds of salt were formed in communication, so to speak, with the sea, it seems strange that they contain so few fossils.

Mixing Proposed as a Mechanism

In view of these difficulties, even for uniformitarians, some other way of depositing these beds was sought. One suggestion was that maybe the mixing of different kinds of brine, say solutions, each originally saturated, of sodium chloride and magnesium chloride, might lead to precipitation of some of the salt. Such a method would avoid the necessity of evaporating a lot of water.

Raup, especially, investigated this mixing.¹ He found that indeed upon mixing much salt might be precipitated. And the precipitation took place without any further evaporation of water, and without any change of temperature.

It is easy to see why those who believe in a world-wide Flood would be interested in his process of mixing, for the Flood surely would have caused mixing on an enormous scale. Thus it seemed worthwhile to repeat some of Raup's work, and to investigate further. This article describes some work along the lines just suggested.

The work was done exclusively with sodium chloride (NaCl) and magnesium chloride (MgCl₂). The results agree with Raup's, as will be pointed out in greater detail later. It was found, upon looking a bit further, that the greatest percentage of the NaCl present in the solution is precipitated when the volume percentage of saturated NaCl is about 20%. This fact suggests that precipitation can occur under conditions less vigorous than those proposed by Raup. For the present, however, such conditions for precipitation remain only a suggestion; they have not yet been tested.

Experiments

All work was carried out as close to 25 °C as possible. The saturated solutions of MgCl₂ and NaCl were prepared by dissolving the appropriate reagent grade salt in distilled water with a magnetic stirrer in a constant temperature bath (25 ± .1 °C). The solutions were prepared at the beginning of the experiment and used throughout the experiment with no detectable change in the concentration of the salts.

The concentration of the chloride in the solution was determined by the Fajan's method.² The silver nitrate was standardized against pure NaCl which had previously been dried at 120 ° overnight. The concentration of magnesium was determined by titration with a standardized (against pure magnesium metal) EDTA solution. Erio T was used as the indicator.³

The densities in this report were determined by weighing 10.00 ml. of the appropriate solution. The volume was measured with a volumetric pipet.

The following general procedure was followed: The appropriate volumes of the saturated solutions were pipetted into a 250 ml no-drip Corning Pyrex beaker. The weight of each solution taken was determined. The exact volume of each solution taken was calculated using the measured densities of the saturated solutions. The solution was swirled to assure complete mixing, covered with Parafilm and allowed to stand overnight. The next day the solution was filtered using preweighed, predried sintered glass filters—either medium or fine. The liquid removed was saved for further analysis. The precipitate was sucked dry and then washed with ethanol. After drying overnight, the weight of the precipitate was determined. The density, and the concentration of the magnesium and the chloride of the filtered solution were then determined.

Calculations and Results

All data points are the average of three determinations. The data and calculate values can be found in Table 1.

Figure 1 contains a plot of the grams of NaCl precipitated based on a total volume of 100 ml versus the volume percentage of the saturated NaCl solution. The plot also contains Raup's values. It can be seen that Raup's values are consistently lower than ours. The difference can readily be accounted for in the error found in our filter procedure. The filter error was always positive by about .02 grams for a sample of 20 ml, thus making our values high by about 0.1 grams for a 100 ml sample.

More interesting results can be obtained if one plots the percentage of the total NaCl initially present that is precipitated as a function of the volume percentage of

*F. L. Wilcox, Ph.D., is Professor of Science at Central Wesleyan College, Central, South Carolina 29630.

†S. T. Davidson, B.A., is a graduate student at the School of Pharmacy, at Charleston, South Carolina.

Table 1. This shows the experimental results. Where appropriate, concentrations are shown in molarity units; and this is indicated in the text, where necessary, by brackets around the formula, in the usual way.

Columns 1 and 2 show the volumes of saturated solution, found by weighing and dividing by the density of the solution. Column 3 gives the concentration of MgCl_2 in the filtrate, as calculated from the EDTA titration. In column 4 is the concentration of NaCl in the filtrate. It was found by getting the concentration of Cl^- by Fajan chloride titrations, and subtracting twice the concentration of MgCl_2 .

Column 5 gives the per cent of NaCl precipitated. This was found by dividing the amount of NaCl collected by the total amount present. The latter amount was found as the product of the initial concentration of NaCl , the volume of solution used, and the factor 58.5.

Column 6 shows the amount precipitated per 100 ml. of solution. In the actual experiments, the amount used was usually close to 20 ml.

Column 7, giving the density, based on 10 ml. of solution, and column 8, giving the percent decrease in volume, are self-explanatory.

Volume of saturated NaCl	Volume of saturated MgCl_2	$[\text{MgCl}_2]_f$	$[\text{NaCl}]_f$	% NaCl Precipitated	gram, NaCl precipitated based on 100 ml total volume	Density final	% Volume change
$1.00 \pm .01$	$19.19 \pm .03$	$4.74 \pm .02$	$0.03 \pm .02$	73 ± 3	$1.17 \pm .03$	$1.301 \pm .003$	0.8 ± 0.1
$2.00 \pm .00$	$18.14 \pm .03$	$4.51 \pm .02$	$0.06 \pm .06$	$80.8 \pm .5$	$2.56 \pm .01$	$1.291 \pm .001$	$1.19 \pm .01$
$2.99 \pm .01$	$17.04 \pm .01$	$4.30 \pm .01$	$0.08 \pm .03$	$83.7 \pm .5$	$3.97 \pm .04$	$1.280 \pm .001$	$2.17 \pm .01$
$4.98 \pm .02$	$15.05 \pm .03$	$3.85 \pm .01$	$0.19 \pm .04$	80 ± 1	$6.3 \pm .1$	$1.258 \pm .004$	$3.44 \pm .08$
$6.99 \pm .01$	$13.05 \pm .03$	$3.39 \pm .02$	$0.409 \pm .006$	$72.9 \pm .3$	$8.08 \pm .04$	$1.239 \pm .004$	$4.9 \pm .1$
$9.01 \pm .01$	$11.02 \pm .03$	$2.851 \pm .009$	$0.85 \pm .03$	$62.6 \pm .2$	$8.94 \pm .02$	$1.220 \pm .001$	$4.54 \pm .05$
$10.01 \pm .01$	$10.02 \pm .02$	$2.590 \pm .005$	$1.11 \pm .01$	$57.1 \pm .3$	$9.07 \pm .06$	$1.213 \pm .001$	$4.44 \pm .03$
$10.01 \pm .02$	$10.06 \pm .02$	$2.58 \pm .02$	$1.36 \pm .02$	$54.9 \pm .2$	$8.72 \pm .03$	$1.215 \pm .001$	$3.49 \pm .07$
$11.01 \pm .01$	$9.02 \pm .05$	$2.30 \pm .02$	$1.490 \pm .008$	49 ± 1	$8.5 \pm .2$	$1.206 \pm .002$	$3.42 \pm .08$
$12.99 \pm .02$	$7.00 \pm .01$	$1.785 \pm .009$	$2.26 \pm .01$	$37.2 \pm .3$	$7.70 \pm .05$	$1.200 \pm .001$	$2.90 \pm .08$
$15.00 \pm .04$	$5.03 \pm .02$	$1.272 \pm .009$	$3.06 \pm .05$	$25.7 \pm .2$	$6.11 \pm .04$	$1.193 \pm .001$	0
$16.98 \pm .03$	$2.97 \pm .01$	$0.752 \pm .004$	$3.33 \pm .02$	$14.6 \pm .3$	$3.93 \pm .06$	$1.192 \pm .001$	$2.00 \pm .09$
$19.03 \pm .11$	$1.0 \pm .1$	$0.250 \pm .004$	$4.99 \pm .02$	$5.1 \pm .3$	$1.52 \pm .09$	$1.189 \pm .001$	$0.8 \pm .2$

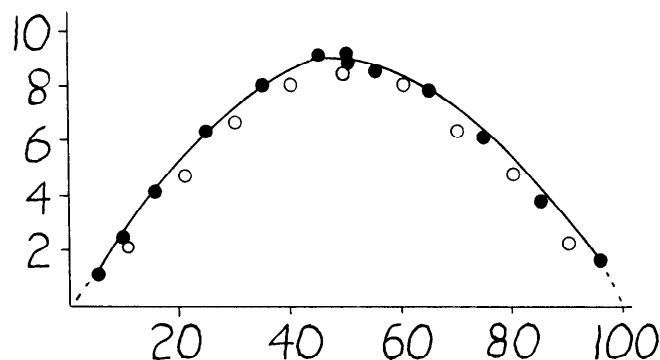


Figure 1. This shows the amount of NaCl precipitated, in grams (plotted vertically) based on a total of 100 ml solution, vs. the volume per cent of the saturated NaCl solution (plotted horizontally). "Volume per cent" is to be understood as follows: a mixture of 40 ml of NaCl solution, for instance, with 60 ml of MgCl_2 solution would be called 40 volume per cent of saturated NaCl solution. The solid points show results from the present experiments; the open circles are from Raup's work.

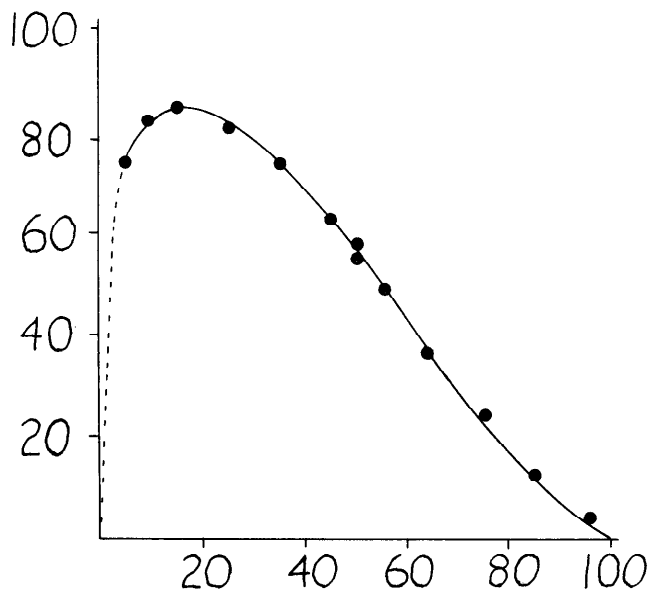


Figure 2. This shows the per cent of the total NaCl which was initially present actually precipitated vs. the volume per cent of the saturated NaCl solution.

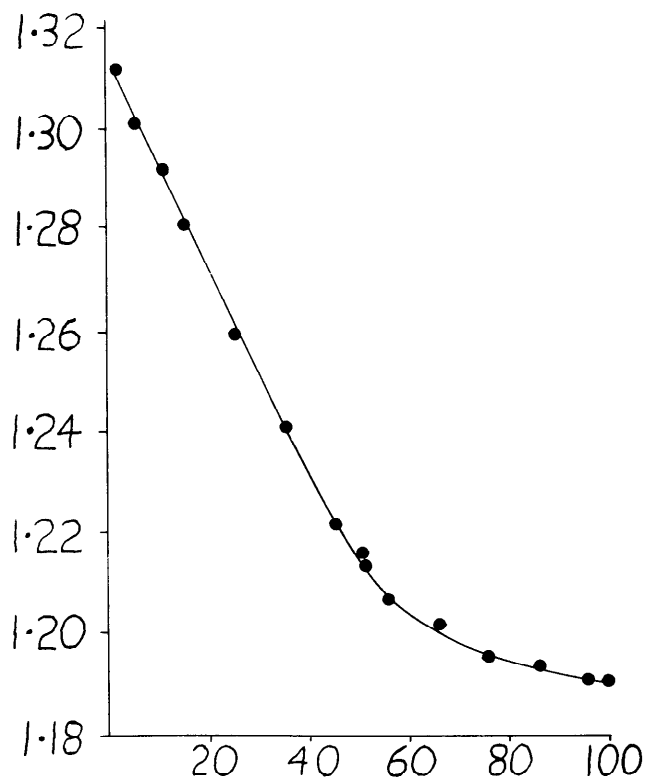


Figure 3. This shows the density of the final solution plotted vs. the volume per cent of NaCl solution.

the saturated NaCl solution. This plot can be found in Figure 2. It can be seen that the greatest percentage of the NaCl is precipitated at a very low volume percentage of the saturated NaCl solution.

This implies that the salting-out of the NaCl is much more efficient under the condition of low volume percentage of the saturated NaCl and therefore should occur under much less rigorous conditions. Raup mixed equal volumes of solutions that were not saturated. It is suggested from this data that the subsaturated solutions be tried with the volume percentage of the NaCl rich solution being about 25%.

The density of the final solution was measured in each case. Figure 3 contains a plot of the density data. It can be seen that the function is not linear. The majority of the decrease (90%) in density from a pure saturated MgCl_2 solution occurs in the first 50 volume percentage. This is also the area where the highest percentage of the NaCl is precipitated.

One indication of what may be happening in this area is shown on Figure 4. This figure contains a plot of the percentage volume change in the solution as a function of the volume percentage of saturated NaCl solution. It can be seen that the greatest percentage volume change occurs in the lower volume percentage of saturated NaCl solutions.

One can speculate as follows. The magnesium ion has a high charge density and as such it tends to orient the water molecules to a large extent. Experiments indicate that the solvation number for magnesium chloride is about 15. The comparable value⁴ for NaCl is 7. A saturated MgCl_2 solution is about 5 M, and has a density of about 1.3 g/ml. Thus there are about 9 water

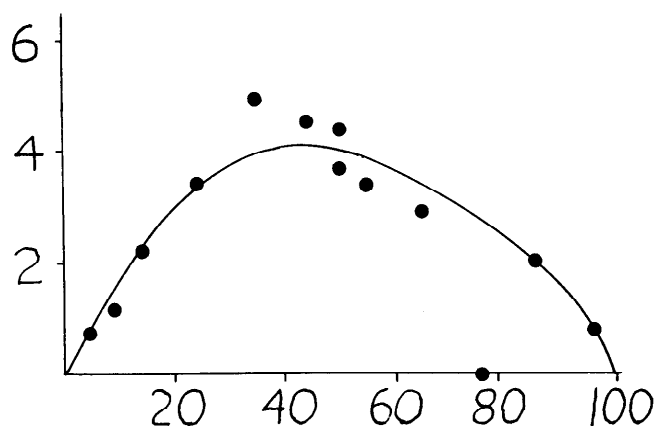


Figure 4. This shows the per cent change in volume of the solution vs. the volume per cent of NaCl solution.

molecules per MgCl_2 unit. For a saturated NaCl solution, the comparable value would be 10. This means that on the average each of the MgCl_2 units can combine with more water, while each of the molecules in the NaCl solutions is complete.

When the two solutions are mixed, the magnesium chloride tends to attract the water molecules from the NaCl. As the number of water molecules available to the NaCl decreases, it begins to precipitate from the solution. In essence the NaCl is being crowded out of the solution. It is granted that the above is speculative and could stand much more study.

Possibilities for Future Research

1) It appears that less vigorous conditions than those used by Raup might still achieve the precipitation of NaCl. Therefore the project needs to be conducted at about 25 volume percentage NaCl solution using sub-saturated concentrations.

2) It might be valuable to investigate the effect of temperature on these precipitations. If some of the flood water in Noah's flood came from within the earth,⁵ it was probably much hotter than that which fell as rain or was already in the sea. Being hotter, it seems that it would have more chemicals in it and that as it moved over the land it would extract more chemicals. Upon mixing with cooler water, a precipitate might form. This is speculative but is an area for research.

Acknowledgement

The work described here was supported, in part, by a grant from the Creation Research Society.

References

- ¹Raup, Omer B. 1970. Brine mixing: an additional mechanism for formation of basin evaporites, *Bulletin of the American Association of Petroleum Geologists* 54(12):2246-2259.
- ²Skoog, D. A., and D. M. West 1969. Fundamentals of analytical chemistry. Holt, Rinehart, and Winston, New York. Second Edition, pages 234 et seq.
- ³*Ibid.*, pages 355 et seq.
- ⁴Robinson, R. A., and R. H. Stokes 1959. Electrolyte solutions. Butterworths, London. Chapter 3.
- ⁵Many believe that the breaking up of the fountains of the great deep, mentioned in Genesis 7:11, could have caused something of the sort.

THE ARK-SHAPED FORMATION IN THE TENDUREK MOUNTAINS OF EASTERN TURKEY

WILLIAM H. SHEA*

About 1959 an object, in shape very suggestive of a ship, was discovered during routine examination of aerial photographs of parts of Eastern Turkey. The shape, and the fact that this object is not very far from Mount Ararat, naturally led to the suggestion that the object might be the Ark. Subsequent examination on the ground, however, showed that the object was a formation in clay, not an artifact of wood. The author suggests here that, while the formation is not the Ark itself, it may be the resting-place of the Ark. For the Ark might have left its impression in mud, which later hardened into clay.

I. Search for the Ark on Agri Dagh

In spite of the fact that more than 30 expeditions have gone to Bü Agri Dagh, the mountain commonly called Ararat, in search of Noah's Ark over the last decade and a half,¹ those expeditions have not turned up any solid evidence or "hard" facts to indicate that the remains of the Ark are located there, or that the right mountain upon which to search has been identified. The identification² of the mountain now known as Agri Dagh as the one upon which the Ark landed dates at least as far back as Jerome in the 4th century A. D., but there is no evidence older than that for such an identification from earlier Christian sources.

According to the Bible, the Ark landed upon the "Mountains" of Ararat (Genesis 8:4). It seems reasonable³ for historical, geographic, and linguistic reasons to locate the Biblical mountains of Ararat in the same region as that later occupied by the kingdom of Urartu which is especially well known in Assyrian texts from the 9th and 8th centuries B. C. The same region was also referred to, but not located precisely, in one of the early epics of Sumerian literature known as *Enmerkar and the Lord of Aratta*.⁴

Beyond this, however, neither the Bible nor ancient texts from the pre-Christian era have provided any evidence for any more precise location of the particular part of the mountains in that area where the Ark landed. From the Biblical viewpoint, therefore, "Mount Ararat" is a misnomer since Ararat was a region, not a solitary mountain.

Aside from these and other traditions, the only additional information available to recent expeditions is that obtained by satellite photography. The only possible substantive evidence consists of wood brought down from Agri Dagh by F. Navarra in 1955, and by Navarra⁵ in cooperation with the SEARCH expedition of 1969. This wood is obviously hand-tooled, looks very old, is said to be white oak, and radiocarbon dates⁶ to the 6th century A. D.

The radiocarbon date of this wood is of considerable interest in view of information given to me by an Armenian colleague, who has been entrusted with publication of some of the Armenian Christian inscriptions copied by Ark-searchers in the vicinity of Agri Dagh. Some of these inscriptions are dated to the 6th century A. D. and they indicate that this mountain was already considered a holy place by that time; and other Armenian traditions, both ancient and modern, indicate that regular pilgrimages were made up the mountain. It would

come as no surprise, therefore, that such pilgrims might have built a shrine on the mountain, which I would suggest is the source of such wood as has been found.

As far as the satellite photographs are concerned, the only place that I am aware of where the general reading public can see such a photograph is in the second edition of John Warwick Montgomery's book, *The Quest for Noah's Ark*.⁷ The first problem with this photo, as he explains, is that when it is enlarged the clarity necessary to outline the Ark is lost, but when it is viewed unenlarged the details are not large enough to outline it. This problem is minor, however, in comparison to that presented by the location on the photograph where Montgomery suggests the Ark may be, for he points to a rectangular outline in a thin ridge that extends out into the Ahora Gulch.

The Ahora Gulch is an extensive rift many miles long and thousands of feet deep and wide in the northeastern quadrant of the mountain. Of the event which produced this topography C. L. Burdick has written,

a conservative estimate would be that from one to two cubic miles of rock debris and volcanic ash were blown from the mountain. The larger surface fragments were hurled miles away, down toward the lower slopes of the northeast side, where they are yet visible.⁸

If the Ark did land on the ledge that protrudes into this gorge as Montgomery has suggested, then it seems most likely that it would have been destroyed when the Ahora Gulch blew out.

II. The Tendurek Mountain Formation

These brief comments on the reasons why Agri Dagh has been identified as the mountain upon which the Ark landed suggest that such evidence is far from conclusive. Agri Dagh may have been the mountain, but then again it may not have been. At least those who have nominated it as that mountain have not produced any evidence which makes that proposal convincing. That being the case, I would suggest that other possibilities should also be entertained, if other evidence is available.

The only other area from which evidence has turned up thus far is located some 50 kilometers southwest of Agri Dagh, at the 6,000 foot level in the Tendurek Mountains. As far as I am aware, it is the only other site studied by an expedition searching for the Ark.

The discovery in this area which stimulated that expedition was made in the winter of 1959 by a captain in the Turkish Army, İlhan Durupinar by name, while he was surveying some aerial photographs of Eastern Turkey taken by Major Sevkett Kurtis for the national

*William H. Shea, Ph.D., receives mail at Route 2, Box 473, Berrien Springs, Michigan 49103.

geodetic survey and NATO.⁹ In surveying those films Durupinar noted an outline in a lava flow that looked remarkably like the outline of a ship. See Figure 1. When news of this find reached the United States, an expedition was organized to go to that site to examine it for the possibility that it might be the Ark. The expedition reached the area in the summer of 1960. It was determined that there were no archaeological artifacts whatsoever at the site.¹⁰

Since no *archaeological* evidence for the Ark or human artifacts were found there, the question arises as to whether this formation could be related to the Ark in some other way, i.e., as geological evidence instead. My first impression from looking at the aerial photograph of this formation in the summer of 1974 was that it might be a lava mold or cast of the Ark, similar to tree molds, etc. found in Hawaii and in other volcanic areas. At that time an acquaintance of mine put me in touch with Dr. C. L. Burdick who had visited this site in 1973; and he was kind enough to supply me with some information about it. The idea that this might be a lava mold of the Ark was quickly dispelled by the information that although this formation lay in a lava field it was:

... not lava at all, but hardened clay carried down by a stream. This was in a volcanic area, however; and apparently an earth fault or fracture opened up, some few hundred feet in length; and up through this fracture magma forced its way through the hardened clay, raising up a body of clay about 550 feet in length and 175 feet in width along the body of the extrusion. At the ends of the extrusion the clay formed a pointed shape like a ship.

The clay side of the "ship" was about 50 feet above the wash from which it arose, leaving deep fissures between the "ship" and the surrounding clay bottom of the arroyo or gulch. The clay carried small rocks embedded in the clay sides of the "ship". Along the center of the "deck" was the raised body of the granitic or rhyolitic intrusion. The whole thing was a remarkable freak of nature.¹¹

Upon further inquiry Dr. Burdick informed me,

It is indeed a very strange phenomenon. From the air it could look like a ship, designed for speed like the Queen Mary

There is nothing about the clay and rock extrusive to suggest a mold. The "ship" extrusion has broken away from the surrounding clay beds and left a two foot crevasse that one could fall into very easily if he were careless. There are no wood or ship impressions of a mold or cast. I suppose the pressure of the rising magma caused the fracture in the rock below allowing the molten magma to rise, forcing the hardened clay above it to rise also. This must have been very recent, far more recent than the time of the flood, else the crevasses along the side of the rising mass would have been filled in with sediment

This ship-like shape appears to be due to the length and shape of the earth fracture or fault through which the magma rose, rather than because of the actual presence of the Ark itself.¹²

The clay composition of this formation raises the question, what kind of surface did the Ark land upon?



Figure 1. The upper part is an aerial view of the formation in the Tendurek Mountains. The circle, of course, was added to the picture to point out the formation.

The lower part is an enlargement of the picture, showing the formation in greater detail. This is a LIFE magazine photo, used by permission of Camera Press, Ltd.

Regardless of what type of rock underlay that surface, it seems likely that the surface that overlay that rock consisted of mud at the time the Ark landed there. This is suggested by the lengthy interval between when the Ark landed and when Noah disembarked, and by the reference in Genesis 8:13 to the drying of the face of the ground where Noah looked. Had the Ark landed in an area of bare rock not overlaid with mud there would have been no need to have delayed departure from the Ark for so long a time while the face of the ground dried up.

If we looked for the mud into which Noah's Ark settled, what form might we find it in today? Other possibilities might be proposed, but I would suggest that the clay of which this formation in the Tendurek Mountains is composed would be what I would expect. What has been studied then is not the Ark but the mud, now solidified into clay, into which the Ark may have settled. This would explain not only the composition of the formation but also its shape.

One need not be an expert in geology, archaeology, or nautical engineering to see that the outline in the photograph above obviously resembles that of the hull of a ship. This was what brought it to İlhan Durupinar's attention, this was what caused some commotion when the aerial photograph of it was published in *Life* magazine, and this was what led to the 1960 expedition that went to examine it.

The expert in aerial photogrammetry from Ohio State University who read the film said of it before going to the field with the expedition, "I have no doubt at all that this object is a ship. In my entire career I have never seen an object like this on a stereo photo."¹³ This formation certainly does have the outline of the hull of a ship, which is a fact that no one has denied; and even Dr. Burdick, who visited the site but does not relate it to the Ark, was impressed with some of its ship-like characteristics, i.e., a prow "like the Queen Mary".

The logical question that stems from this is, if this is the place where the Ark landed, then where is the Ark? Aerial photographs of this area taken in 1959 show that this formation lies in a lava flow, and this interpretation has been confirmed by surface observation since that time. The answer to this question seems rather evident, therefore, since a ship constructed of wood in such a situation would have burned.

According to the temperatures sampled at active volcanoes and laboratory experimentation, erupting magmas generally reach about 1000 °C., or approximately 2000 °F. While the wood of the Ark might have been more resistant to heat than modern woods, there does not appear to be any doubt that it would have burned when surrounded by such a flow.

In view of the hypothesis that wood may have burned here the soil that lies within the confines of the walls of this "ship" is of some interest. According to the color photograph supplied me of that area, the soil there looks quite gray. This may not at first appear remarkable because it does not contrast with the surrounding lava field. On the other hand, the color photograph of the outside of this clay wall above the crevasse around its base shows a rather brown color mixed with the red of some iron oxides, as a geologist has pointed out to me.

One might suggest, therefore, that the gray color of the soil inside this formation may be significant and that the color could be an indication that the soil contains considerable ash. In addition, a member of the 1960 expedition to this site told me that it appeared to him that the soil within those walls had a particular greenish hue. If this observation is correct, it would be of interest to see whether that soil contains any evidence for the presence of algae or chlorine-containing compounds.

III. The Alternative Interpretation

The principal alternative interpretation of this formation to the one proposed here is the one proposed by Dr. Burdick. His interpretation is that the clay which hardened here was first carried down by a stream and then it was uplifted by magma that came up through a fracture in the earth located directly beneath it. This explanation breaks down into two causative forces, the stream that laid the clay down and the magma that lifted it up. Taking the last point first, it still is open to question whether the lava surrounding this formation came out from a fracture under it or was part of a more general flow in the area.

This suggestion was based upon surface observations alone but the aerial photographs of the area demonstrate the direction of flow of the lava in the field in which this formation lies. It seems more likely to me that the lava surrounding it was part of a large flow that passed through this area, hence its appearance as a ship caught in a stream in the aerial photograph.

The more important part of this problem is not how this formation was uplifted, but how it was laid down. According to either of the two hypotheses under discussion it was laid down by water, either as the bed of a stream or as a bed for the Ark as the waters of the Flood receded. Since the stream-laid interpretation is under consideration here the question is, is there evidence to indicate that a stream was responsible for depositing the clay in this formation? It does not seem to me that the geologists who proposed that this formation was laid down by a stream or those who have accepted that interpretation have spelled out the logical consequences of that interpretation.

Any basin that is 500 feet long, 150 feet wide, 20 feet deep, and is oval or tear-drop in shape is no ordinary bed of a stream. In fact, it is not the bed of a stream at all. Rather, it would have to be the collecting basin for such a stream, i.e., it would be the bed of a pond or small lake into which that stream drained. In that case the inlet to it must have been the sharper upper end or "bow", and the rounded lower end or "stern" must have been the most dependant part of the collecting basin that prevented outflow from it.

There are some problems with this interpretation. The greatest problem with it probably is that no attempt has been made to identify the bed of the stream that supposedly fed this basin and it does not show up in the aerial photographs. From the standpoint of the aerial photographs, this formation is a very solitary phenomenon. The geologist who visited this formation described it as having broken away from clay beds which lay in an arroyo or gulch. Whether those clay beds provide evidence for the bed of the stream which

fed this formation remains to be seen since such evidence has not been described in detail.

One member of the 1960 expedition has told me that he saw no evidence for such a drainage system. Perhaps it has been covered by lava or is no longer recognizable due to erosion. On the other hand, maybe this formation was not formed by a stream and such characteristics of drainage as are present in that arroyo or gulch were formed subsequent to the time this depression was made. Only clarification through field study can settle this matter.

A corollary to this problem is the question of why the bed of this pond or lake was lifted alone without any contiguous portion of the connecting stream bed being lifted with it. There is also the question of how this depression could have been formed by a stream flowing down a slope of 11.5° , the current angle of incline according to measurement.¹⁴ Perhaps the pitch of this portion of the slope was less steep before it was lifted. It is also curious that this stream just happened to form a basin the length of the Ark and with the outline of the hull of a ship. Considering these problems with this interpretation it is not surprising that Dr. Burdick referred to it as a "very strange phenomenon" and a "remarkable freak of nature" at the same time that he proposed it was laid down by a stream.

IV. Measurements

Along with the ship-like appearance of this formation, striking features are the measurements. The first estimate of the professor of photogrammetry who studied the photographs in 1960 was that it was about 150 meters in length. He subsequently refined his measurements from the photographs to state that the object was 500 feet in length with a width of 160 feet and reached a height of 20 feet in some places. His plans that appear in R. Noorbergen's book, *The Ark File*, are given in meters, $150 \times 48 \times 7$ respectively.¹⁵ In his discussion of the activities of the expedition Noorbergen does not cite the specific measurements they took in the field but he does quote the same expert in photogrammetry as stating in their press release, "our measurements in the field verify our laboratory findings".¹⁵ (See also page 128 of the reference.)

Genesis 6:15 gives the measurements of Noah's Ark as $300 \times 50 \times 30$ in terms of cubits. The possibility that these measurements were made using a longer antediluvian cubit cannot be entirely ruled out, but in view of the context of the post-diluvian cubits employed elsewhere in the Pentateuch it seems more likely that a post-diluvian cubit was intended. If these Biblical measurements represent translations into any of the known post-diluvian cubits, then the 300-cubit length of Noah's Ark and the 150-meter length of this formation correspond in an impressively close degree.

Assuming a Mosaic authorship for these measurements probably would indicate that they were given in terms of the Egyptian cubit of 20.6 inches rather than the shorter Mesopotamian cubit. An Ark of 300 Egyptian cubits would have exceeded the more precise measurement of 500 feet for this formation from the aerial photographs by 16 feet, and if the bow and stern of the Ark were inclined rather than perpendicular they could

have projected beyond this 500-foot form. Since minor variables are involved in both figures they should not be pressed too far, but even allowing for such variables it is obvious that the correspondence between the two is very close.

Other details should also be compared between the two. The walls of this formation reach only half as high at their highest point as the sides of Noah's Ark according to the Biblical 30 cubits, but one need not expect that the mud, into which the Ark settled, reached as high as the gunwales or deck. H. M. Morris suggests on the basis of Genesis 7:20 that the draft of the Ark may have been 15 cubits.¹⁶ If there is some merit to that suggestion, then this figure would fit reasonably well with what has been found here, although one need not expect the Ark to have sunk so deep in mud as it did in water.

Weathering through the years certainly has reduced the height of the walls of this formation. Aside from the rather obvious differentiation between the bow and stern in these walls, there is also the gap in one side of the formation just forward of "midships". This could be compared to the entrance in the side of the Ark referred to in Genesis 6:16 if a gangplank or something similar was let down such that an imprint was left.

The breadth of the two objects under comparison here is another matter. The 50-meter breadth for the widest distance between the clay walls of this formation in Turkey is wider than one would expect from the 50 cubits in the Bible. As far as I am aware, there are no textual variants in the different Bible manuscripts to explain such a difference. One might suggest, therefore, that if this formation is related to the Ark, then a variant for this figure was introduced into the text early in the course of transmission, similar to those variants for some of the other numbers in the Old Testament, which some believe can be found.

However, this textual problem might be resolved, from the standpoint of nautical engineering the wider the Ark the better, it would seem. In essence, this ship-like formation in the Tendurek Mountains is the same length as Noah's Ark, but it is twice as wide at its widest point as the figure given in the Bible for the breadth of the Ark. The stability of a vessel in stormy seas is basically a function of the relationship of breadth to height more than length, in conjunction with the weight and distribution of the cargo.¹⁷

In other words, the most important single measurement for a ship's stability in stormy seas is breadth, and the wider the ship the more stable it should be. Thus a ship built along the lines of this formation would have been even more stable than one 50 cubits wide and 30 cubits high, which was quite stable already according to Morris' calculations.¹⁸

The 6:1 ratio for the length to breadth of Noah's Ark in the Bible has been compared favorably with that of modern ships. It should be remembered, however, that modern ships are designed to be propelled through the water and, generally speaking, the faster the better within certain limits. The Ark, on the other hand was prepared for the purpose of floating on the waters of the Flood in order to insure the safety and survival of the passengers.

While the 3:1 ratio of the formation in the Tendurek Mountains might have produced more drag in a ship

designed with such proportions that was meant to be propelled through the water at a reasonable rate of speed, it would have been superior for the simple purpose of flotation. Not only would such a design have been more stable, but it probably would also have accommodated a larger volume of animals and food for them.

V. Criticisms

Through the kind office of one of my colleagues, the preceding draft of this study and three photographs of the formation (one aerial, one inside surface, and one outside surface) were submitted to three geologists, two paleontologists, and one geophysicist. I have benefited by their criticisms and some of the information from their comments has already been incorporated in what has been written above.

But I would like to review briefly their other criticisms, and for this purpose I have chosen to designate them simply as ScA, (Scientist A), ScB (Scientist B), etc. ScA said my suggestion did not make good geological sense to him and he followed the stream-laid interpretation of the formation proposed by Dr. Burdick.¹⁹ He also appears to be of the opinion that the mud into which the Ark settled should now be actual rock and not clay.

ScB also gave a negative evaluation of my proposal, largely because he is strongly of the opinion that the Ark was rectangular in shape; but that is far from certain from the text. ScC did not offer an interpretation of the formation, but he did think that both Agri Dagh and Tendurek were unlikely landing spots for the Ark because of where they would fit in a flood model as volcanic mountains.

Both ScC and ScD think that carrying the search for the Ark to 14,000 feet of elevation (Agri Dagh) or even 6,000 feet (Tendurek) is looking for it too high. ScE said he did not feel there was adequate evidence to make a decision upon the nature of this formation without further first-hand examination of it. ScF concurred that "this could be the mold of a ship, namely Noah's Ark; that the wood could have been destroyed by fire or decayed until no evidence is now available; and that the natural or geological interpretations for this phenomenon at present appear strange and 'unnatural'".²⁰

He still held out the other possibility, however, that this formation might have been created by stream action: "It may be that actual observations would indicate that stream action is an unreasonable explanation. However, based on what little data we have we cannot rule out stream action as a possibility."

In summary then, of the six evaluations received two were negative, one specifically so as far as the nature of the formation was concerned, three were neutral to the extent that they did not wish to make any judgement upon the nature of this formation without more detailed information about it, and one was sufficiently positive to concur with the idea that this might be a mold of the Ark, although he held out that it could also be something else.

Since five out of six of those who responded did not feel there was sufficient evidence currently available upon which to make a judgement of whether this formation relates to the Ark or not, it seems reasonable to

suggest that a more careful and detailed examination of this site would be worthwhile to obtain whatever evidence is available to determine what that relationship may be.

VI. Conclusion

A review of the results accomplished in the field by those who have been searching for the Ark on Agri Dagh indicates that searchers have not yet produced any evidence for the presence of the remains of the Ark there. Since the identification of the mountain upon which the Ark landed still is in question, any evidence from the general area, not just that one mountain, should be carefully scrutinized. Under the influence of accounts related by a few elderly Armenians and Russians, all of whom are now dead, Ark-searchers have been looking only for the Ark, or a sizeable portion thereof readily recognizable as the Ark.

Given the volcanic nature of the area involved and the ravages of the elements in the course of time, however, that may be placing too high a demand upon the evidence for the Ark that one might expect from the field. Not only should other locations be considered, therefore, but other types of evidence should also be taken into account.

If the scope of the search for the Ark is widened thus, then the ship-shaped formation in the Tendurek Mountains ranks as the only undisputed evidence that has ever been found in the Middle East thus far that could possibly be related to the Ark. My approach to the interpretation of this formation is admittedly simplistic. Any object that obviously resembles the outline of a ship, that corresponds very closely to the length of the Ark given in the Bible, and that certainly is located in the Biblical mountains of Ararat should be given serious study for the possibility that it may be related to the Ark.

Is the Tendurek formation then, as has been suggested above, a mold or cast of the Ark? The answer to this question must eventually be "yes" or "no", but those answers may be qualified by the kinds of evidence that can be obtained to substantiate them. Logic extends the possibilities here to four:

1) This formation may not be related to the Ark, but there may not be adequate evidence from the field to substantiate that interpretation.

2) This formation may not be related to the Ark, and there may be adequate evidence from the field to substantiate that interpretation.

3) This formation may be related to the Ark, but there may not be adequate evidence from the field to substantiate that interpretation.

4) This formation may be related to the Ark, and there may be adequate evidence from the field to substantiate that interpretation.

The range of these possibilities supports the suggestion of ScF who wrote: "This site needs to be studied in much greater detail by archaeologists and geologists who would be able to take sufficient time to get some definitive data." As far as obtaining that data is concerned, one might contrast the situation here with that involved in exploring Agri Dagh.

The Tendurek Mountain site is much more accessible and therefore less expensive to study; it does not carry

the risk of life and limb that is involved with work on Agri Dagh; and given the current political climate and the irritations caused by the overeager actions of groups interested in working on Agri Dagh,²¹ a permit to work on this formation could be obtained probably with less difficulty than one to work on Agri Dagh.

To conclude, one might put these two sites in perspective by reflecting upon what would have happened had this formation been found on Agri Dagh. I may be wrong, but I suspect that news of it probably would have been heralded far and wide as the discovery of the site where the Ark had rested. What a difference a mountain makes.

(Editor's Note: Schmich, J. E. 1974. The Flood and the Ark, *Creation Research Society Quarterly* 11(2):120-122, has suggested another fate which might have overtaken the Ark. He suggested that it might have been cannibalized for building material soon after the Flood.)

References

- ¹Cummings, Eryl 1974. The search for Noah's Ark (in) A challenge to education II, Edited by W. Lang. The Bible-Science Association, Caldwell, Idaho, page 98.
²Cummings, Violet M. 1972. Noah's Ark: fact or fable? The Creation Science Research Center, San Diego, page 40.

- ³Piotrovsky, B. B. 1959 (Translation, 1969). The ancient civilization of Urartu. This book gives a good survey of the history and culture of Urartu.
⁴Kramer, S. N. 1963. The Sumerians. University of Chicago Press, pages 269-272.
⁵Navarra, F. 1974. Noah's Ark: I touched it. Edited by D. Balsiger, translated by R. H. Utt. Logos International, Plainfield, New Jersey. This book deals with both the 1955 and 1969 expeditions. See also Cummings, 1972. *Op. cit.*, pages 271-273.
⁶Noorbergen, Rene 1974. The Ark file. Pacific Press, Mountain View, California, pages 142-144.
⁷Montgomery, John W. 1974. The quest for Noah's Ark. Second edition, Pyramid Books, New York. See plates 10 and 11 between pages 192 and 193.
⁸*Ibid.*, p. 238 (Quoted).
⁹Noorbergen, *Op. cit.*, pp. 114-129.
¹⁰*Ibid.*, pp. 127-129.
¹¹Personal communication, 16 September 1974.
¹²Personal communication, 2 October 1974.
¹³Noorbergen, *Op. cit.*, p. 118. (Quoted)
¹⁴*Ibid.*, p. 154.
¹⁵*Ibid.*
¹⁶Montgomery, *Op. cit.*, p. 48. Originally Morris, Henry M. 1971. The Ark of Noah, *Creation Research Society Quarterly* 8(2):142-144.
¹⁷Montgomery, *Loc. cit.*
¹⁸Montgomery, *Op. cit.*, p. 52.
¹⁹Communication with L. T. Geraty, 7 October 1975; and used here with his permission.
²⁰Communication with L. T. Geraty, 29 September 1975; and used here with his permission.
²¹See, for instance, *Acts and Facts* for July and August, 1975, published by the Institute for Creation Research, San Diego, California.

On Understanding Ancient Writings

Many speakers, even preachers, have stated that, in order to understand what ancient writings really mean, the reader, must get behind the thought-patterns of the writer, or try to fit into his world-view, or something of the sort. In so far as this means that the idiom must be understood, and that it helps to have some knowledge of the unexpressed presuppositions which may be present in any writing from any age, few would dispute the mentioned position.

In practice, though, the statement seems often to be in preparation for, or an excuse for, taking the writing, especially if it is Scripture, in almost any sense except the plain meaning of the words stated. If the statement is intended in this last sense, it should be challenged.

The most important reason for reading Scripture is for the sake of instruction. Now there are other cases in which one derives instruction from old works, but nobody has ever proposed that one must get behind the words of classical writers, say, or try to get inside the author's processes of thought.

For instance, Euclid's *Elements* seem to have been written about 300 B. C. Thus it is much older than the New Testament, and not too much younger than the last books of the Old Testament. Now the *Elements* was used as a book of instruction, a text-book of geometry, until less than a century ago. And nobody ever denied that it is possible to learn about geometry from the *Elements*, understanding what is written there in a plain

and ordinary sense. The *Elements* has been superseded as a textbook, not because it is impossible to learn from it, or because it was necessary to perform the feat of getting inside Euclid's mind, but merely on the grounds that other treatments were easier for the students.

Again, surely logic is a factual matter, if anything is. Few would deny that it would be possible to learn logic from the original treatment, Aristotle's *Analytics*, especially the *Prior Analytics*, which was written presumably about 330 B. C. The fact that almost no one tries to do so is again a matter of convenience. It is true that the matter is complicated by the fact that there is a tendency to follow the way in which logic was expounded in the Middle Ages, which differed somewhat from Aristotle's treatment in the way in which it was expressed. But nevertheless one could obtain true and valid instruction in the subject from Aristotle's works.

It would not be hard to give other examples of ancient secular writings from which a person could still get valid and true instruction. So it simply is not true that ancient writings, just because they are ancient, must be approached in some special way. Like any other writings to which one turns for instruction, they must be approached above all with a will to learn. And since this is true even of human and secular writings, how much more is it true of Scripture, whose Author does not change?

—Editor Armstrong

THE ELLIPTICAL FORMATION IN THE TENDUREK MOUNTAINS

CLIFFORD L. BURDICK*

The author was able to visit the formation which some have thought to be connected in some way with the Ark. In his opinion it has nothing to do with the Ark, but is a geological and tectonic phenomenon.

The Initial Discovery

About 1959 aerial photographs of parts of the Tendurek Mountains of Eastern Turkey were brought to public notice. The point of interest was an elliptical formation, having an outline roughly that of a ship, which appeared in the photographs. (As shown in the preceding article, by Shea.) Captain Sevkett Kurtis had taken these photographs; and he brought them to the Ohio State University, where he was doing advanced work in connection with aerial surveying.

A specialist at the Ohio State University, upon examining the photograph, believed that the object could be none other than the Ark of Noah.

The picture was published in several magazines and newspapers. It appeared in Life magazine. The Staats Zeitung and Herald, Woodside, New Jersey, 15 November 1959, published the picture, with a caption: "Stereo-airphotos at Mount Ararat show petrified boat in a field of lava, possibly Noah's Ark of the Bible". About the same time, a writer in a newspaper in Columbus, Ohio, commented in part:

Discovered with stereoplanograph. The air photos were taken a year and a half ago on behalf of the Geodetic Institute of Turkey. But a curious object was just recently discovered in one of the photos. It was discovered when, in Ankara, Captain İlhan Durupinar used a stereoplanograph in order to prepare maps. The size corresponds with the description of the Ark in the Bible and in the Koran. The object has the form of a boat, 450 feet long and 160 feet wide. . . . Kurtis said that the object is sunk in a field of lava.

A member of the Geodetic Institute of the Ohio University, after he had seen the stereophotographs, said that he was convinced that the object could not be a product of nature, but was possibly "a petrified boat". "There is a ship on Ararat," he declared positively, "and someone had better find out how it got there."

The Expedition to the Site

It would be pointless to recount all of the negotiations with the Turkish Government personnel in obtaining permission to visit the site. Eventually the Archeological Research Foundation of New York was chosen with George Vandeman as director of the expedition.

There were doubters, of course; since most of the stories of past finds of the Ark placed it on Mount Ararat. The Tendurek Mountains, while in plain view of Ararat, are still many miles from it. Besides, the photographs of the object showed a prow as pointed as that of the Queen Mary, while many believe that the Ark was blunt or square at the ends, like a barge or scow.

*Clifford L. Burdick, D. Sc., is a geologist who has done much exploration in search of minerals. He has also taken part in several of the expeditions looking for the Ark. His address is 924 N. 6th Avenue, Tucson, Arizona 85705.

Eventually the expedition, accompanied by Captains Durupinar and Kurtis, reached the site; completed some excavation of the formation, and even resorted to some blasting. To the disappointment of all, they found nothing but dirt. Naturally, there were those who seized the opportunity to say: "We told you so". One periodical writer, for instance, remarked that the disappointment should have been no surprise, for most experts entitled to express an opinion had always claimed that the Biblical story of the Flood had no more factual basis than tribal tradition.

How the Author Came to Visit the Formation

After the disappointment, when it turned out not to be an artifact, the formation was almost forgotten for some years. Meanwhile, searching for the Ark on Mount Ararat continued, as opportunities arose. In the summer of 1973 a group, of which I was a member, was permitted to search on Ararat. Other members included Dr. Lawrence Hewitt, the director, Eryl Cummings, John Willis, Joeff McMahon, and J. S. Darnall.

We established our base camp on the northeast side of the mountain, at an elevation of about 12,000 feet. Three hardy members of the group climbed higher, to establish a high camp at the edge of the ice cap, at about 14,000 feet. All the uncovered canyons were searched, but without success in finding the Ark. Many photographs were taken.

The Turkish government had arranged for an officer, who spoke good English, to accompany us. He reported daily to his superiors in the army camp below at Dogubayaset concerning developments.

The Russians knew of our activities; and they were continually complaining to the Turkish government about our presence. We were not looking for any Ark, they suggested; that was merely a coverup. Actually, they said, we must be spies from the C.I.A. Why should anyone else be taking so many photographs? (Of course we could sit in front of our tents and, with binoculars, see about 15 Russian cities across the Aras river boundary.)

One evening, when I was visiting with the Turkish officer, he mentioned to me this suspicion about our identity. I assured him that our interest was purely scientific. Our main object was to find the Ark of Noah. My own work was that of a geologist, mapping the mountain and the surrounding area.

As a result of this conversation, Mr. Cummings and I were invited to visit the commanding general at Dogubayaset. Accordingly, we reported there the next day. The general was very gracious; and, after we had explained the object of our search, he invited us to take a trip with him. He explained that he would show us the sacred object for which we had been looking for so long, the Ark of Noah.

We arrived in the Tendurek Mountains, and soon came in sight of the ship-like natural phenomenon

which had disappointed so many some 13 years previously. Since we were there, and had not seen the formation before, we determined to settle, at least to our own satisfaction, whether this might perchance be the storied Ark after all—or at least have some connection with it.

The Actual Formation

The elevation of the formation in the Tendurek Mountains is about 6,000 feet. That seemed to us too low to agree with the reports of eye-witnesses, according to whom the Ark is at an elevation of about 14,000 feet. In contrast with Mount Ararat, from which rocks are continually breaking and rolling to lower ground, the Tendurek Mountains appear older, having a more mature topography. The relatively gentle nature of the slopes can be seen in Figure 1.

And, as can be seen in Figure 1, the phenomenon in question lies along a broad, well peneplaned contour. What had looked like a flow of lava in the aerial pictures turned out to be a deep deposit of clay, intermixed with small breccia, along the bed of a stream.

From a tectonic standpoint, apparently what had happened was that a small fault or fracture of about 450 feet (approximately the length of the Ark) occurred along the bed of the stream. Actually, by pacing, I estimated 500 feet. The “prow” of the formation was uphill from the stern.

Apparently a granitic or rhyolitic type of intrusive lava had pushed up through the clay along the center of the formation, making an elevated ridge along the center, as can be seen in Figure 2. The ridge does look something like the keel of a ship—but upside down. This outcrop of rock should have been an obvious clue to the nature of the phenomenon.

Apparently the extrusion widens a few feet below the surface, along the center part of the formation, thus giving the whole thing the outline of a “ship”. Possibly as the molten or plastic rock mass rose through the clay bed of the wash, it raised the hardened clay with it. The hardened clay did actually simulate the sides of a ship, and from a distance one could easily accept such an interpretation.

The height of the clay extrusion varied from a few feet to perhaps 30 feet. As can be seen in Figure 3, the clay extrusion broke away from the rest of the bed of the wash, leaving a crevasse about two feet wide. This crevasse appears to be quite deep—one would not wish to fall into it.

The eruption which caused this formation must have taken place comparatively recently. Otherwise the crevasse would have been filled with sediment brought down by the stream. In fact, from the freshness of the clay crevasse, and the fact that the fracture has not been filled by erosion and sedimentation, I should judge that the eruption occurred only some 25 or 30 years ago. However, precipitation may be limited in that region, and hence erosion and sedimentation slow. In that case the formation might be rather older.

Although in an aerial view the formation may look quite ship-like, it does not take a geologist on the site long to dismiss the notion that the strange phenomenon is an actual ship. Some have suggested that a ship was



Figure 1. This is a general view of the formation in the Tendurek Mountains. The picture shows also the general nature of the surrounding country.



Figure 2. This is a closer view of the formation. Note the rocky ridge running along the center.



Figure 3. This shows the crevasse formed where the formation broke away from the surrounding clay. It is to the right (his right) of the boy, who is the son of the Turkish general who took us to see the formation.

once there, but was burned by the heat of the lava. To investigate that possibility, Mr. Cummings and I hunted for charcoal, or charred remains of a ship; but we were unable to find any.

Conclusions

For the reasons already given, I cannot believe that this formation has anything to do with the Ark. I feel that our time could have been better spent searching in areas where eyewitnesses have reported having seen some kind of ship on Mount Ararat in the last 100 years.

Incidentally, the reports of eyewitnesses would seem to corroborate the deduction made above: that this formation is quite young. None of the reports include mention of anything closely resembling this formation. But the formation is fairly accessible; surely if it had been there for centuries it would often have been reported as the Ark. Conversely, if the whole formation is comparatively young, it can, of course, have nothing to do with the Ark.

It is true that, as far as I know, no one has reported having seen a ship on Ararat in recent years. The reason, however, might well have to do with cycles of

weather. A few years with less snow than usual, or hot summers in which more ice than usual melted, could leave the Ark uncovered, or at least partly so. On the other hand, while much snow, or cool summers, are common, it would remain hidden.

Reliable eyewitnesses claim to have seen the Ark about 100 years ago; about 60 years ago, during World War I, when Russians reported having seen it; and about 20 years ago. Bishop Nouri, who visited Chicago during the World's Fair of 1893, was reported in the Chicago Tribune to have seen the Ark; and he lectured about it in Chicago. Theodore Roosevelt vouched for his reliability.

I knew an Arizona man, Fred Drake, a prospector who had worked with a George Green about 1952, searching for oil in Utah. Green had worked for oil companies in Turkey; and he claimed that he had flown around Mount Ararat and taken pictures of a giant boat high on the mountain. My friend Drake had seen the pictures many times; and he was convinced as to the reliability of the account of the Flood in Genesis. However, no follow-up has been possible because Green was killed while prospecting in South America; and his relatives do not know what became of his pictures.

THE FOETUS AS A PERSONALITY†

SIR WILLIAM LILEY*

The author points out that the foetus, even in fairly early stages of development, is by no means a vegetable-like object. It displays motion, sensitivity, and, in a rudimentary form at least, most of the attributes of a sentient living being.

Introduction

I did not choose the title of this presentation. Had I done so, I would have been more careful in my selection of words. The foetus is part of my province of medical practice, and personality is part of yours. But whereas I am sure that you could all define, describe and even recognize a foetus, I am not so confident that I can define personality. One dictionary offers "what constitutes an individual as a distinct person", but does not define what the "what" is. Another dictionary asserts "the state of existing as a thinking intelligent being". This definition might lead to the inference that personality increases *pro rata* with intelligence, or that some people may not have a personality at all if we followed Bertrand Russell's dictum that "most people would rather die than think and many, in fact, do!"

My copy of the late Ken Stallworthy's *Manual of Psychiatry* is more help with the definition that "per-

sonality is the individual as a whole with everything about him which makes him different from other people", because we can certainly distinguish foetuses from each other and from other people. With the next sentence—"personality is determined by what is born in the individual in the first place and by everything which subsequently happens to him in the second"—we are really in business. Not only can I tell you what is apparent of what is born in the foetus, but I can also describe the environment in which he lives, the stimuli to which he is exposed, and the responses which he displays. Therefore it might have been more apt to title this presentation, "A day in the life of the foetus", and together we can revisit a stage of life which we all experienced but which, superficially at least, none of us remembers.

Such a journey is justified for several reasons. For many centuries interest in foetal life was restricted to anatomical studies by embryologists or to mechanical problems in delivery as they presented to the accoucheur. The legacies of this era are well known—particularly the attitude that, apart from some aimless kicking which began in the fifth month, the foetus was a placid, dependent, fragile vegetable who developed quietly in preparation for a life which started at birth.

In the present century, many disciplines have extended their interests to include the foetus, but in fields from surgery to psychiatry the tendency has been to

*Sir William Liley, K. C. M. G., D.Sc.(Hon.), Ph.D., M.B., Ch.B., B. Med. Sc., Dip. Obst., F.R.S.N.Z., F.R.C.O.G., F.A.C.O.G., is Research Professor in Perinatal Physiology at the University of Auckland, Auckland, New Zealand.

†Presented at the 8th Annual Congress, A.N.Z.C.P., Auckland, October, 1971; published originally in the *Australian and New Zealand Journal of Psychiatry*, volume 6, pages 99-105, in 1972. It is reprinted here by permission, and in the belief that it will be of great interest to many readers of the *Quarterly*. The abstract, which has been added here, was not part of the original article.

start with adult life and work backwards—knowing what the adult state was, one worked back to what seemed a reasonable starting point to reach that goal. Therefore, in fields from physiology and bio-chemistry to education and psychology, there has grown up the habit of regarding the foetus and the neonate as a poorly functioning adult rather than as a splendidly functioning baby.

Until recently, the human foetus *in situ* was inaccessible to study and this seclusion has had two further unfortunate results. First, much reliance has been placed on animal experiment in spite of the fact that there is more variation throughout the mammalian order in reproductive physiology than in the physiology of any other body function. Second, for want of experimental verification or repudiation, theories have flourished without serious challenge.

As a consequence, at one extreme, J. J. Rousseau and his pupils could regard the foetus as a witless tadpole with a mind like a cleanly washed slate—the *tabula rasa*—and at the other extreme some interpreters of dreams considered the foetus a skilled voyeur, spying on his parents having intercourse—a sort of “what the butler saw” through the cervix.

Foetus Is in Command

If, with regret, we must abandon such fascinating conjecture, I hope that we can replace it with equally interesting fact, because recent advances in foetal diagnosis and therapy have provided both the technology and opportunity to piece together a new picture of the foetus. Far from being an inert passenger in a pregnant mother, the foetus is very much in command of the pregnancy.

It is the foetus who guarantees the endocrine success of pregnancy and induces all manner of changes in maternal physiology to make her a suitable host.

It is the foetus who, singlehanded, solves the homograft problem—no mean feat when we reflect that, biologically, it is quite possible for a woman to bear more than her own body weight of babies, all immunological foreigners, during her reproductive career.

It is the foetus who determines the duration of pregnancy.

It is the foetus who decides which way he will lie in pregnancy and which way he will present in labour. Even in labour the foetus is not entirely passive—neither the toothpaste in the tube nor the cork in the champagne bottle, as required by the old hydraulic theories of the mechanics of labour.

Much of the behaviour of the neonate and infant can now be observed *in utero* and, by corollary, a better understanding of the foetus and his environment puts the behaviour and problems of the neonate in better perspective.

In his warm and humid microclimate, the foetus is in neither stupor nor hypoxic coma. From the few electroencephalographic studies, he appears to show cyclical activity, the lighter periods of which correspond in the neonate to a drowsy wakefulness from which he is readily aroused by a variety of stimuli. Like all internal organs, the uterus is insensitive to touch, indeed, to all stimuli except stretch.

Hence foetal movements are not felt in the uterus but in the maternal abdominal wall, which explains why quickening is not apparent until 16 to 22 weeks of gestation. The foetus has been moving his limbs and trunk since about 8 weeks, but some 10 or more weeks elapse before these movements are strong enough to be transmitted to the abdominal wall. In some 40 per cent of pregnancies, an additional cushion, the placenta, is on the anterior uterine wall, and this phenomenon plus variation in foetal position explains why maternal account or external palpation may be a very erratic guide to foetal vigour and welfare.

Comfort Determines Position

Foetal comfort determines foetal position, but comfort presents no problem in the first half of pregnancy when the foetus inhabits a relatively large and globular cavity. He is under no restriction and has no axis or stability. Occasionally these conditions still prevail in late pregnancy—in the presence of polyhydramnios, or with a uterine cavity truncated by a fundal or praevia placenta—and then we see an unstable lie. Normally, however, in the second half of pregnancy, the uterine cavity is no longer globular but becomes progressively more ovoid with the lower pole narrower, and the foetus elongates more rapidly than the uterus. Therefore the foetus tends to be corralled into a longitudinal lie.

However, amniotic fluid volume reaches a maximum at about 28 to 32 weeks, and until this time the foetus is far from cramped and under no obligation to lie well flexed. As amniotic fluid volume diminishes and foetal bulk increases from 32 weeks to term, comfort becomes more difficult to achieve. If he chooses to flex his knees, the foetus will present by the vertex as his head forms a smaller pole than his back, thighs, calves and feet, and this disposition corresponds to the polarity of the uterine cavity. If however he elects to extend his knees, he will fit in best as a breech since his tapering trunk and thighs form a smaller pole than his head, calves and feet.

Variations of uterine contour, unusual size or location of the placenta, and the presence of another foetus may all present further challenges to foetal comfort and ingenuity and produce stable malpresentations. Foetal position, whether he lies with his spine anterior, posterior or lateral, is determined by other influences. In late pregnancy, the most important of these are the location of the placenta, which converts the circular cross section of the uterus to an oval, the tone of mother's uterine and abdominal wall, the shape of the maternal lumbar lordosis, and the inclination of the pelvic brim. Maternal movement and change of maternal position, Braxton-Hicks contractions, and external palpation all disturb the foetus and may provoke him to seek a new position of comfort. He will repeatedly and purposefully seek to avoid the sustained pressure of a microphone or phonendoscope or of a knuckle on prominences.

The mechanism by which the foetus changes ends in the uterus is simple—he propels himself around by his feet and legs. The mechanism by which he changes sides is more subtle—he employs an elegant longitudinal

nal spiral roll and at the midpoint of his turn has a 180° twist in his spine. He first extends his head and rotates it, next his shoulders rotate and finally his lumbar spine and legs—in fact, he is using his long spinal reflexes. Insofar as this is the obvious way to turn over, there would be nothing remarkable about it except that according to textbooks of neonatal and infant locomotor function the baby does not roll over using his long spinal reflexes until 14 to 20 weeks of extrauterine life.

However, we have unequivocal films of the foetus using this mechanism at least as early as 26 weeks gestation, and it is apparent that the reason we do not see this behaviour in the neonate is not that he lacks the neural co-ordination but that a trick which is simple in a state of neutral buoyancy becomes difficult under the new-found tyranny of gravity.

The very early embryo develops in flexion, but beyond this stage there is little evidence to justify the traditional assumption that flexion is fundamental in foetal musculoskeletal development. In midpregnancy with plenty of room neutral buoyancy and intervertebral discs virtually synovial joints, he can assume postures difficult or impossible for the child or adult. In late pregnancy, as the foetus elongates more than the uterus, he must fold to fit in. Commonly the attitude is again one of flexion, but sometimes he elects to lie with neck, trunk or limbs extended and sometimes grossly hyperextended, a preference he will continue to express as his position of comfort after birth, particularly in sleep, if nursed naked in a warm environment.

Foetal Movement Is Necessary

Foetal movement is necessary for the proper development of foetal bones and joints. The foetus without muscles—amyotrophia congenita—has the slender bone structure more familiar in the victim of paralytic poliomyelitis. From the characteristic and uniform angulations in different limb segments, it is apparent that the fractures in the foetus with fragilitas osseum, the “battered baby *in utero*”, are self-inflicted by the baby's own muscles. The foetus who is severely constrained *in utero* like a pound of deep frozen sausages with extreme oligohydramnios presents an assortment of compression deformities with severe restriction of joint range of movement.

The realization that the foetus himself determines the way he will lie in pregnancy and present in labour by making the best he can of the space and shape available to him puts the practice of version in new perspective, and nowadays fewer obstetricians assume that they know better than the foetus how he will be most comfortable. Of course, in selecting a position of comfort in late pregnancy, the foetus may have chosen a position which is difficult or impossible for vaginal delivery. In this regard he may be accused of lack of foresight, but this is a trait not unknown in adults.

The foetus is responsive to pressure and touch. Tickling the foetal scalp at surgical induction of labour provokes movement, stroking the palm of a prolapsed arm elicits a grasp reflex, and to plantar stimulation the footling breech obliges with an upgoing toe. Being totally immersed, the foetus does not feel wet nor cough or choke with his airway full of fluid. The peripheral

sensation of wetness and the irritation of fluid in the airways are dependent on surface tension effects at gas/fluid interfaces, and normally wetness is a new experience at birth. That this experience, however, may be startling if not uncomfortable for the foetus is suggested by the one recorded case of air amniography where the presence of a substantial volume of intra-amniotic air led to prolonged loud foetal crying.

Since the foetus lacks an external surface of his own, his temperature inevitably cannot be less than his mother's. Among many other functions, the placenta is his heat exchanger and its performance may be gauged by the fact that foetal temperature is normally 0.5–1.5°C above maternal core temperature. If mother runs a fever the foetus must also. The walls of the foetal world are probably not thermally homogeneous, as thermography shows that the areas of the maternal abdominal wall over the placental site are several degrees hotter than areas over the *chorion laeve*. Although the range of ambient temperature to which the foetus is exposed is limited, his awareness of and reactions to thermal stimulation are intact before birth. If cold saline is run into the amniotic cavity, he shows appropriate motor and circulatory responses.

The foetus responds with violent movement to needle puncture and to the intramuscular or intraperitoneal injection of cold or hypertonic solutions. Although we would accept, rather selfishly, that these stimuli are painful for adults and children and, to judge from his behaviour, painful for the neonate, we are not entitled, I understand, to assert that the foetus feels pain. In this context I think Bertrand Russell's remark in his *Human Knowledge, its Scope and Limitations* rather apt—he relates, “A fisherman once told me that fish have neither sense nor sensation but how he knew this he could not tell me.” It would seem prudent to consider at least the possibility that birth is a painful experience for a baby.

Radiological observation shows foetal limbs flailing during contractions, and if one attempts to reproduce in the neonate by manual compression a mere fraction of the cranial deformation that may occur in the course of a single contraction the baby protests very violently. And yet, all that has been written by poets and lyricists about cries of newborn babies would suggest that newborn babies cried for fun or *joie de vivre*—which they never do afterwards—and in all the discussions that have ever taken place on pain relief in childbirth only maternal pain has been considered.

Karelitz in New York has shown that, as judged by the strength of stimuli required to arouse them, the first sleep of neonates is more profound than any subsequent sleep, and this is perhaps hardly cause for surprise when we know that labour may represent very prolonged stimulation and interference with normal foetal activity cycles.

Foetal Swallowing Discussed

The foetus drinks amniotic fluid in a phasic pattern throughout pregnancy, and measurement by isotopic techniques shows that his consumption has an effective rate of interquartile range 15 to 40 ml per hour in the third trimester. Now the foetus has a much larger num-

ber and a much wider distribution of taste buds in his oral cavity than the child or adult, but no-one knows—or can recall—whether the taste or flavour of amniotic fluid varies much or if, for instance, meconium stained fluid tastes worse than normal fluid.

However, experimental modification of the taste of amniotic fluid produces dramatic results. Foetal drinking rates crash after the injection of the contrast medium Lipiodol®—an iodinated poppy seed oil which tastes foul to an adult or child and which causes a neonate to grimace and cry. Conversely, de Snoo (1937) claimed that saccharin stimulated foetal swallowing, and our isotopic measurements support this claim with usually an approximate doubling of rate. However, some foetuses drink less after saccharin injection and perhaps, like the author, they find saccharin in concentration bitter rather than sweet.

Foetal swallowing appears the major if not the only route of disposal of amniotic fluid colloid and hence, especially in the second half of pregnancy, has an increasingly important effect on amniotic fluid homeostasis and volume. The foetus who cannot swallow, for example with oesophageal or duodenal atresia, has a polyhydramnios. Since foetal swallowing powerfully influences if not regulates amniotic fluid volume, what influences or regulates foetal swallowing? Now the foetus gains nourishment from amniotic fluid, for he digests the constituents of amniotic fluid. His caloric intake from this source may reach 40 calories per day and the foetus who cannot swallow is “small for dates”. Traditionally it has been assumed that hunger is a brand new sensation after birth, that *in utero* an obliging mother and faithful placenta have supplied baby's every need. However, the sight of babies with gross intrauterine malnutrition makes it rather hard to believe that every foetus lives in a metabolic Nirvana.

Could foetal hunger be the stimulus to foetal swallowing? Rather contrary to expectation on this hypothesis, in general, large, well-nourished babies swallow at a high rate and small, grossly malnourished babies at a very low rate. We could of course suggest that the malnourished child has passed beyond the hunger pangs and into the state of apathy and anorexia known from extrauterine starvation. However, the fact that the large, well-nourished foetus has a bulimia and the small, malnourished foetus an anorexia accords well with endocrine evidence that much of what has been called traditionally placental insufficiency is in fact primarily foetal and of hypothalamic origin.

Foetal hiccups are common and often can be induced by irrigating the amniotic cavity with cold solutions. Foetal hiccups are easily recognized, and mother should be reassured, for some have misgivings about these episodic series of clonic movements, especially if there is an epileptic somewhere in the family cupboard.

The foetus is not only experienced in swallowing, but also in many cases in suckling. In the neurological examination of the neonate, the “seeking” or “rooting” reflex is elicited by stroking the circumoral area. The baby opens his mouth and turns to the stimulus. This reflex is clearly the mechanism by which baby homes on the nipple and underlines the tremendous importance of feeding to the neonate. Indeed his face and mouth are the only part of his body the neonate can reliably

locate in space and the mouth remains one of the chief tools of exploration in infancy. Since the foetus is often lying with hands and feet in close proximity to his face, he may readily elicit a seeking reflex himself. Accordingly, it is not uncommon in obstetric radiology to detect the foetus sucking thumbs, fingers or toes, and thumbsucking has been photographed in the 9-week abortus.

Incidentally, the common observation in neonates of clenched fists, which would appear to preclude thumbsucking, is not a feature of babyhood really but of high thermal tone in muscle. Careful examination of hand position in x-rays shows that usually the foetus with his low thermal tone in his warm environment has his hands relaxed and his thumbs protruding.

Foetus Is Light, Sound Sensitive

Perhaps nowhere does the notion of foetal life as a time of quiescence, of patient and blind development of structures in anticipation of a life and function to begin at birth, die harder than in the concept of the pregnant uterus as a dark and silent world. Indeed even as great a neurophysiologist as Sir Charles Sherrington (1951) could speak of “the miracle of the human eye developing in darkness for seeing in light and the miracle of the human ear developing in silent water for hearing in vibrant air”.

As anyone familiar with a phonendoscope knows, a pregnant abdomen is not silent, and the uterus and amniotic cavity, especially with any degree of polyhydramnios, may be readily transilluminated with a torch in a darkened room. Given a naked abdomen in sunshine, light intensities would be much higher. With a fibre optic light conduit and photomultiplier, not only can the intrauterine illumination produced by an external tungsten or quartz iodide lamp be recorded, but the shadow cast by the foetus is detectable.

Now, for activation of visual pathways, there is strictly no threshold, for the visual rods respond individually to single photons. Sure enough, Smythe (1965) at University College Hospital found that flashing lights applied to the maternal abdominal wall produced fluctuations in foetal heart rate. However, with the high attenuation in tissue, the abnormal spectral composition and the boring view, what the foetus lacks is adequate illumination and a worthwhile image for practice in cone or macular vision. At birth he can see but does not know what he is looking at. Confident recognition of familiar people and reassurance from the sight alone of mother takes some 4 to 7 months of extrauterine life to acquire. However, before this age the baby can be reassured by a familiar voice alone in the dark, and we have to argue either that auditory recognition of patterns matures more rapidly than visual recognition, or that auditory experience began earlier. The latter seems more likely.

Sudden noise in a quiet room—the dropped gallipot or maternal voice—startles the foetus lined up under an image intensifier, and from at least 25 weeks the foetus will jump in synchrony with the tympanist's contribution to an orchestral performance. By applying intermittent pure tones by hydrophone or air microphone to the maternal abdominal wall, foetal audiometric curves

may be constructed by recording the abrupt changes in foetal heart rate.

There is dispute among the professionals as to sound energy levels reaching the foetus (a given sound energy produces higher sound pressure levels in fluid) and naturally the state of foetal wakefulness and the maintenance of attention span are very hit and miss. Nevertheless, averaging of foetal electroencephalographic records with repeated stimuli shows sound evoked cortical potentials and demonstrates as does experience with deaf mothers that the foetus is responding directly. Both habituation and conditioning—dare we say learning?—have been noted.

With tympanic membranes damped by fluid in both middle and external ears, the foetus could be expected to have a relative hightone deafness, but higher frequencies suffer less loss than low frequencies in transmission through tissues and fluid. Therefore, it is probable that with sound, unlike light, intrauterine spectra are similar to extrauterine. Further, it is worth noting that, unlike most foetal organs which start off in miniature, the structures of the inner ear are very nearly of adult size from initial development. This magnitude of course is necessary because cochlear spectral response obeys simple physical laws dependent on cochlear dimensions. If, for instance, the cochlear grew in proportion to the rest of the body, babies and children would hear in a different frequency range from adults and the communication gap between generations would be even wider than it is already.

However, it is not only external sound which bombards the foetus. The pregnant uterus or abdomen is itself a very noisy place. The loudest sounds to reach the foetus or an intrauterine phonocatheter are maternal borborygmi peaking to 85 decibels. Reaching and below 55 db the content is richer in pattern and meaning—the intermittent voice and the all pervading bruits, pulsing in synchrony with maternal heart beat, of blood in the great arteries supplying the uterus and placental bed.

Does this long exposure explain why a baby is comforted by holding him to your chest or is lulled to sleep by the old wives' alarm clock, or the modern magnetic tape of a heart beat? Does this experience explain why the tick of a grandfather clock in a quiet study or library can be a reassurance rather than a distraction, why people asked to set a metronome to a rate which "satisfies" them will usually choose a rate in the 50-90 beat per minute range—and twins show a strong concordance in independent choice?

Elias Carnetti points out that all the drum rhythms in the world belong to one or other of two basic patterns—either the rapid tattoo of animal hooves or the measured beat of a human heart. The animal hoof pattern is easy to understand from the ritual and sympathetic magic of hunting cultures. Yet, interestingly, the heart beat rhythm is more widespread in the world—even in groups like the plains Indians who hunted the great herds of bison. Is this rhythm deeply imprinted on human consciousness from foetal life?

Not only do the human eye and ear, therefore, not develop in darkness and silence, but there is also good reason to believe from experimental work and comparative physiology that they would not develop

properly in those conditions anyway. As with other foetal organs, development of structure and development of function go hand in hand. And if the function cannot be subserved without the development of the structure, equally the stimulus of the function is necessary for the proper maturation of the structure.

The mechanism by which a concept of sensory space develops has long been a troublesome topic for psychologists. However, for the amateur dabbler, the subject has received some much-needed simplification by the evidence that the various sensory modalities all feed and share a common space, and that this space in fact is the effective motor space. This synthesis certainly has logical simplicity to anyone who compares, say, the tunnel vision of the jet pilot or freeway driver with the short cone extending just a few yards ahead of the walker on rough ground and encompassing the field of the next few paces. Parallels in auditory function are easily drawn. When does such a concept of space begin? Refined experiment on the neonate suggests that his sensory space is a little ball, that although he may receive visual and auditory signals from more distant sources he is not much interested in anything outside a sphere which extends just beyond his toes—a restriction which very neatly corresponds to his recently vacated home.

This then is our picture of the foetus. He does not live in a padded, unchanging cocoon in a state of total sensory deprivation, but in a plastic, reactive structure which buffers and filters, perhaps distorts, but does not eliminate the outside world. Nor is the foetus himself inert and stuporose, but active and responsive.

Does the Foetus Learn?

Since on the one hand the foetus is exposed to a variety of stimuli, and on the other hand can sense and respond to them, presumably we have the prerequisites for learning of some sort. Is there in fact any evidence or suggestion that the foetus has learned anything *in utero*? Study is understandably difficult, for not only are nature and nurture at least as intricately entangled in intrauterine life as in extrauterine life, but for good measure any but the briefest observation and test after birth may be compromised by the high rate of learning in the neonate. For instance, babies who have had as few as 10 heel punctures for blood samples in the first 72 hours after birth, for weeks or months afterwards will promptly cry if you thoughtlessly grasp their foot.

That recognition by voice precedes recognition by sight and the world preference in drum rhythms is suggestive of foetal learning, or at least imprinting. What of circadian rhythms? It is known that there is not one physiological clock but numbers of relatively independent clocks, some more stubborn than others. Moreover, that such rhythms are modified, if not determined, by activity cycles rather than of cosmic origin is strongly suggested by the evidence that the diurnal rhythms of the inhabitants of fishing villages, living by the tides, are lunar not solar in periodicity. In this context, it is interesting to reconsider the claim, at least of young parents, that the one thing that shows the foetus is utterly stupid is that many neonates do not seem to appreciate that night is a time for sleep.

We know that maternal movement and change of position provoke foetal movement, that if we want a foetus lying still and unsuspecting for some diagnostic or therapeutic procedure it is necessary to have mother lying still and comfortable for 15 to 20 minutes to allow the foetus to find a position of comfort. Further, we must avoid last minute palpations and auscultations. Compare these precautions with the performance and restlessness of many pregnant women in bed—with the leg cramps and heartburn, the subcostal and pelvic girdle discomfort, and for variation a trip or two to the bathroom. The neonate could perhaps be forgiven if, as a foetus, he had gained the impression that night was anything but a time for rest.

A similar *crt de coeur* concerns those young babies who cussedly elect to have their briefest rest periods and shortest intervals between feeds in the late afternoon and at dinner time just when it would be most helpful if they would sleep. For the breast fed baby, a ready explanation arises from the fact that there is a striking diurnal variation in the fat content of human milk—from as high as 9 per cent in the early morning to as low as 1 per cent in the afternoon. Hence the breast fed baby may be shortchanged on calories on his afternoon feeds. However, precisely the same pattern may be seen in the bottle-fed baby, and we are left with the suspicion that the foetus may have been conditioned to the fact that this time of day represents peak activity for mother and peak uproar in many households.

A question very commonly asked is whether maternal emotion—elation, fear, anxiety, may be communicated to or influence the foetus. Certainly, with monitored foetal hearts there may be abrupt changes in rate with sudden maternal emotion. Such responses could be mediated indirectly by changes in maternal arterial pressure, or directly by substances, for instance catecholamines, which cross the placenta. It has been argued that since the foetus experiences only the consequences and not the cause of the emotion itself the experience

would mean nothing to him. More recently this view has been challenged on the evidence that the pharmacological induction of the physiological responses to fear and anxiety induces the sensation of fear and anxiety also—but this may be just a learned response.

It is apparent that many more questions may be asked but as yet few answers given. What I have tried to do is to provide a background, so that by asking the right questions in the right way we might some time get the right answers. We may not all live to grow old but we were each once a foetus ourselves. As such we had some engaging qualities which unfortunately we lost as we grew older. We were physically and physiologically robust. We were supple and not obese. Our most depraved vice was thumbsucking, and the worst consequence of drinking liquor was hiccups not alcoholism.

When our cords were cut, we were not severed from our mothers but from our own organs—our placentae—which were appropriate to our old environment but unnecessary in our new one. We do not regard the foetal circulatory system, different as it is from the child's or adult's, as one big heap of congenital defects but as a system superbly adapted to his circumstances. We no longer regard foetal and neonatal renal function, assymetric as it is by adult standards, as inferior, but rather entirely appropriate to the osmometric conditions in which it has to work. Is it too much to ask therefore that perhaps we should accord also to foetal personality and behaviour, rudimentary as they may appear by adult standards, the same consideration and respect?

References

- de Snoo, K. 1937. Das trinkende Kind im Uterus. *Mshr. Geburt. Gynak.*, 105:88.
Karelitz, S. Personal communication.
Sherrington, C. 1951. *Man on his Nature*. Second Edition. Cambridge University Press, Cambridge.
Smyth, C. N. 1965. Experimental methods for testing the integrity of the foetus and neonate, *J. Obstet. Gynaec. Brit. Comm.*, 72:920.

THE PROBLEM OF ABORTION†

DAVID R. NICHOLAS* AND GEORGE F. HOWE**

The preceding article, by Liley, contains the facts about the nature of the fetus. It is good first to get facts; but sometimes facts are not enough, action is called for, as St. James 1:22 points out. Here the authors draw the conclusions which follow from the nature of the fetus, and from the teaching of Scripture.

Introduction

In His great wisdom God has determined that physical life shall pass from one generation to another across a fragile bridge of just two cells. To understand this link and how a separate life begins, one must visualize that structure of a living cell.

The body of an adult is composed of about 90 trillion cells. Different kinds of cells vary in their structure, but each one is a living sac covered by a cytoplasmic membrane that surrounds the jellylike cytoplasm.

Although the cytoplasm is a fascinating region with a specific internal structure and organization, another area is of crucial interest. The nucleus, which is

*Rev. David Nicholas has served for the past four years on the staff of the First Baptist Church of Van Nuys, as Dean and President of Van Nuys Christian College.

**George F. Howe, Ph.D., is Professor and Chairman, Division of Natural Sciences and Mathematics, Los Angeles Baptist College, Newhall, California 91321.

†This article was published in *The Baptist Bulletin*, beginning on page 10, April 1971, and is reprinted here, in a somewhat condensed form, by permission. This is a little different from the usual article in the *Quarterly*. Yet readers will agree that there comes a time when Christians must take a stand on matters such as the one considered here.

The abstract, given above, was not part of the original article; and the Conclusions have been re-written to fit in better with this condensed version. — Editor

engulfed by the cytoplasm, is a slightly flattened sphere. Surrounded by a nuclear membrane, the nucleus houses several finger-shaped chromosomes that carry a chemical material known as DNA which controls exact duplication of cells.

The number of chromosomes present in the cells of any living organism is specific and surprisingly constant. The nucleus of nearly every human cell contains 46 chromosomes, while nuclei of corn cells have 20 and horseworm cells possess only four. The even number in each instance shows that chromosomes within the nuclei of many creatures come in pairs—two of each type. In the typical human nucleus, for example, there are actually only 23 different types of chromosomes so that two of each type provide the final tally of 46.

The marvelous basis for human reproduction is the fact that the organs involved (ovaries and testes) produce special gamete cells which contain only half the normal adult number of chromosomes—one of each pair. Thus each of the many sperms produced in the testes of a man contains a nucleus with a total of only 23 chromosomes. Likewise, the egg cell released each month from the ovaries of a woman contains but 23.

The egg or sperm cells are simply portions of the adult body which are particularly capable of uniting to form a new individual. Before such union has taken place, however, the egg cell or the sperm is by no means a separate being but rather a cell of the parent's body with exactly half the general number of chromosomes.

Fertilization Occurs

Fertilization is an amazing process in which only one sperm unites with the egg. Billions of sperms are present, of course, and are essential because each one carries a small portion of an enzyme which is required in large amounts to permit any penetration of a layer that protects the egg. After a channel has been digested through this jacket and one sperm has finally entered, a fertilization membrane forms immediately around the egg cell. This covering immediately renders the fertilized egg impervious to other sperms which still surround it in great numbers. Soon the nucleus of the one sperm unites with the nucleus of the egg at which instant the number 46 is restored among the chromosomes. The fertilized egg so formed can no longer be viewed as a mere portion of either parent's body but is a separate cell with the usual chromosome number—the *first cell of a new human being*.

The single cell passes through a sequence of changes that would stagger the wildest visions of a design engineer. Descriptions of these events fill thousands of pages in embryology textbooks. By repeated divisions, the first cell becomes two, then four, then eight, and finally yields a delicate living sphere of many cells called the blastocyst.

Becoming attached to the rich nutritive lining of the mother's uterus, the blastocyst continues to grow. A portion of this cell mass becomes the placenta, a nutritive link through which food and oxygen pass from the mother to the developing child. Another cluster of cells in the blastocyst forms layers which mysteriously cooperate in the synthesis of organs in the tiny body. A twentieth-century knowledge of embryonic growth

would have added to the awe which the Psalmist felt as he contemplated God's role in governing the formation of a living fetus:

Thou hast covered me in my mother's womb . . .

My substance was not hid from thee, when I was made in secret, and curiously wrought in the lowest parts of the earth. Thine eyes did see my substance, yet being imperfect; and in thy book all my members were written, which in continuance were fashioned, when as yet there was none of them (Ps. 139: 13, 15, 16).

At birth the contact with the placenta through the umbilical cord is severed. With a gasping breath the infant fills his own lungs with air for the first time and experiences major changes in his blood circulatory system. The newborn child is indisputably human; but at least the physical stamp of man was seen upon his form much earlier.

A continuum of uninterrupted biological development leads from single cell to blastocyst and then from blastocyst to an embryo's miniature frame. At only 26 days the little body has a heart, limb buds and blocks of muscle tissue. Although it is only about three-fourths of an inch long after forty days, the embryo possesses eyes, ears, and minute hands. At 56 days an unmistakably human physical structure is present, complete with fingers, toes, and ribs.

But when does the developing embryo become a completely human being in the fullest and Biblical sense of the term? No absolute answer can be given to this question at present and several opinions prevail. This means that there is no fixed point in embryonic development before which one could kill the fetus and safely say he had not thereby extinguished a human life.

Abortion and the Bible

The expulsion of a human fetus from the uterus prematurely, with the stoppage of its life, is known as abortion. In a few pregnancies the embryo dies and abortion occurs spontaneously. The current interest in abortion has nothing to do with such natural miscarriages, but is rather about the deliberate unnatural termination of embryonic life, which is often called therapeutic abortion.

Definite mention of therapeutic abortion does not occur in Scripture. Biblical law does deal with miscarriage caused by a blow to the mother:

If men strive, and hurt a woman with child, so that her fruit depart from her, and yet no mischief follow: he shall be surely punished, according as the woman's husband will lay upon him; and he shall pay as the judges determine. And if any mischief follow, then thou shalt give life for life (Exod. 21: 22, 23).

Dr. Bruce K. Waltke,* Professor of Semitics and Old Testament at Dallas Theological Seminary, believes these verses describe a case in which a woman suffered a miscarriage with the death of the fetus. He holds that the further "mischief" which might follow refers to death or injury of the mother also. He concludes that

*Note added in page proof: Readers will find that Dr. Waltke has changed his position on these verses in his article in the 1976 spring issue of *Bibliotheca Sacra*.

God did not impose the death penalty if only the fetus dies with no harm to the mother, but exacted instead a money compensation to indemnify the father for his loss. (See *Birth Control and the Christian*, published by Tyndale House, Wheaton, Ill.)

Another view of Exodus 21:22, 23 is possible, as Keil and Delitzsch have made plain (Pent. II, pp. 134, 135). Possibly the "mischief" which might follow and which would require life for life was not limited to the killing of the mother alone; perhaps it also covered the death of the unborn child. Verse 22 might then have dealt with the instance in which the blow had caused the woman to deliver her child prematurely and neither mother nor child was permanently harmed. In such a case, the offender was to pay a fine for his reckless misdeed. But if "mischief" followed, meaning death to either the mother or the unborn child, then a life was to be given for a life.

In neither of these interpretations does Biblical law provide any sanction for abortion. As in the Bible, so in the code of Hammurabi, a miscarriage caused by a man other than the husband always carries an accompanying penalty from death to fines. Furthermore, this passage is a discussion of miscarriage and has no direct application to induced abortions, therapeutic or otherwise!

Dr. Waltke also advances numerous Biblical passages in which conception is viewed as a gift of God. At the birth of Cain, Eve declared that she had received him from the Lord (Gen. 4:1). In Genesis 29:31 it is written that the Lord took pity on Leah, opening her womb. Of Ruth it is recorded that "the Lord gave her conception" (Ruth 4:13). Dr. Waltke also emphasizes the fact that the Scriptures place value on the fetus as seen in David's wonderful words of Psalm 139:13-18.

In a criticism of induced abortions, Dr. John Warwick Montgomery of Trinity Seminary asked this pointed question:

†Here Montgomery means, supposing the first interpretation of Exodus 21:22, 23, proposed above, to be understood. In any case, even with that interpretation, the passage does not condone abortion or causing a miscarriage, it merely assigns a lighter penalty to it.

Should a passage such as Exodus 21† properly outweigh the analogy of the incarnation itself, in which God became man at the moment when conception by the Holy Ghost occurred—not at a later time as the universally condemned and heretical adoptionists alleged? (See *Birth Control and the Christian*.)

One must recognize the sovereign purposes of God in the conception and embryological development of David and Paul. David saw through inspiration that he had been known of God and protected during these early days. The Apostle Paul stated that he was set apart from his mother's womb for a definite purpose:

But when He who had set me apart, even from my mother's womb, and called me through His grace, was pleased to reveal His Son in me, that I might preach Him among the Gentiles, I did not immediately consult with flesh and blood (Gal. 1:15, 16, New American Standard Bible).

Since God's plan for reproduction includes the development of life in the willful sexual union between two people, who is man to intervene by destroying the embryo thus conceived?

Conclusions

It has been shown, first, that there is no stage at which the fetus can be said, with any claim to certainty, not to be a human being (Liley's article led to the same conclusion); and secondly, that Scripture shows that the fetus is an object of God's care and concern. In view of these facts, it can hardly be denied that to destroy the fetus is an evil act.

Those who campaign for "abortion by choice" always refuse to debate the question, whether the fetus is a human being. Their arguments ultimately come down to the alleged benefits of abortion. In other words, they are campaigning for evil to be done in order that good may result (or so they say). But it is a general principle, granted by all Christian philosophers, that evil is not to be done on the pretext that good will result. These things having been granted, there is no case for abortion by choice at all.

RESEARCH SPONSORED AND ENCOURAGED BY THE C. R. S.

An important activity of the Creation Research Society is the conducting, encouraging, and sponsoring of research having a bearing on creation. The following information, about some parts of that activity, was compiled from the report to the annual meeting of the Board of Directors, April 1976, by Dr. Emmett Williams, Chairman of Research; from correspondence with Dr. Williams; and from other sources.

Several research projects, sponsored by the Society, have been reported recently in articles in the *Quarterly*.¹⁻³ Projects now being sponsored include the following:

1) The effect of the Earth's magnetic field on the concentration of C-14 as a function of geographic coordinates, height above the Earth, and time.

2) A study of precipitation caused by brine mixing. Actually, there are three separate projects concerned with the matter.

3) *Drosophila* mutants and selection in a rigorous environment.

4) Laboratory formation of dripstone.

The Creation Research Society is interested in supporting other suitable research. Any proposals for such work should be sent to the Chairman of Research, Dr. Emmett Williams, Jr., Bob Jones University, Greenville, South Carolina 29614.

Dr. William J. Tinkle is continuing his studies of mutant plants.⁴ He has found tomatoes, and also cam-
pion, which come up with three cotyledons (the first

(Continued on Inside Back Cover)

BIOMAGNETIC EFFECTS IN THE LIGHT OF THE FORMERLY STRONGER GEOMAGNETIC FIELD

ROBERT VINCENT HAMBY*

There are now many data on effects of magnetic fields on living beings. Here these data are considered along with information which shows that the Earth's magnetic field is decreasing. The greater strength of field in the past may correlate with greater lifespans, such as those recorded in the early part of Genesis.

Introduction

It has been demonstrated through analysis of available data that the Earth's magnetic field is decaying exponentially with time, and that accordingly it has been exponentially greater in the past.¹ What effects a greater magnetic field might have had on living systems is purely speculative. Yet experiments such as those reported in the two volume work, *Biological Effects of the Magnetic Fields*² may provide an experimental basis for further study.

Experiments performed by Dr. Jenő Barnothy indicate retardation of aging and stabilization of the genetic code (via proton tunneling) as magnetic effects.³ Other investigators have observed the existence of a magnetic threshold, i.e., an effectual field strength above which magnetic effects are essentially constant and below which the effects are absent. Moreover, threshold values vary according to the life system under study.

Experiments and Results

The Barnothy experiments were performed with C3H-strain virgin female mice which were 70 days old. Ten were subjected to a homogeneous field⁴ of 4200 Oe, while five others were kept in identical dummy magnets, and 25 others were kept in standard plastic cages. All of the mice were removed from the test conditions after four weeks and their activity was monitored electrically from age 320 days to 509 days "at which time 50% of the treated and 60% of the controls were dead or had developed spontaneous cancers."⁵

Dr. Barnothy recorded that between the ages of 430 days and 509 days that food consumption was about 26% lower for the magnetically treated group. "This finding, together with higher activity, would suggest a better energy metabolism of the treated mice."⁶

The cause for higher activity and lower food consumption of the treated mice is indicated by a remarkable photographic comparison (Figure 1) of a magnetically treated mouse and a mouse kept in an identical dummy magnet, both at age 400 days.

The appearance of the treated mouse is far younger, its fur is smooth, and no wrinkles are seen. The difference in appearance and in movements at this age was so striking that when the treated were mixed with the untreated, any person even unfamiliar with mice could correctly separate them. During the next three months the difference in appearance gradually decreased and eventually vanished.⁷

A second experiment of identical procedure was performed except treatment began at age 270 days instead of at 70 days.

No difference between treated and control groups, either in appearance, in activity, or in food consumption, was observed up to their highest age. This experiment would indicate that treatment at a full grown age, contrary to treatment during youth, does not have an effect upon the accumulation and total number of genetic code errors.⁸

More recent contributors to the field of biomagnetic research have observed

the existence of a threshold field strength, below which the field is ineffective. This is indicated by investigations on respiration rates, alkali ion excretion, and on the mitosis rate of liver tissues . . . the value of the limiting field strength seems to change with the parameter under investigation. Moreover, above this threshold value the effect is not proportionally enhanced in stronger fields.⁹

Experiments supporting the existence of a magnetic threshold strength are published in Volume 2 of *Biological Effects of Magnetic Fields* under the following titles:

Effects of Magnetic Fields on Cellular Respiration by Elton S. Cook, John C. Fardon, and Leo G. Nutini.¹⁰

"Changes in Sodium and Potassium Content of Urine from Mice Subjected to Intense Magnetic Fields" by G. D. Hanneman.¹¹

"Effects of the Magnetic Field on Internal Organs and the Endocrine System of Mice" by M. F. Barnothy and I. Sumegi.¹²

Discussion

The salutary effects on mice reported by Dr. Barnothy were not the result of magnetic stress.¹³ However, it should be emphasized that stress effects were observed in the treated mice, though they have been omitted from this discussion. Furthermore, experiments showing the existence of a threshold field strength (different for each parameter) have not, to date, been associated with retardation of aging nor with a stabilization of the genetic code.

It is hoped that this review will stimulate further investigation of biomagnetic effects with a view to possible incorporation into the creation model. In light of the historically stronger geomagnetic field, and with reference to the preceding experiments, it is felt that the study of biomagnetic effects may be a promising area of creation research.

*Robert Vincent Hamby is a senior biology major at the University of Texas at San Antonio.

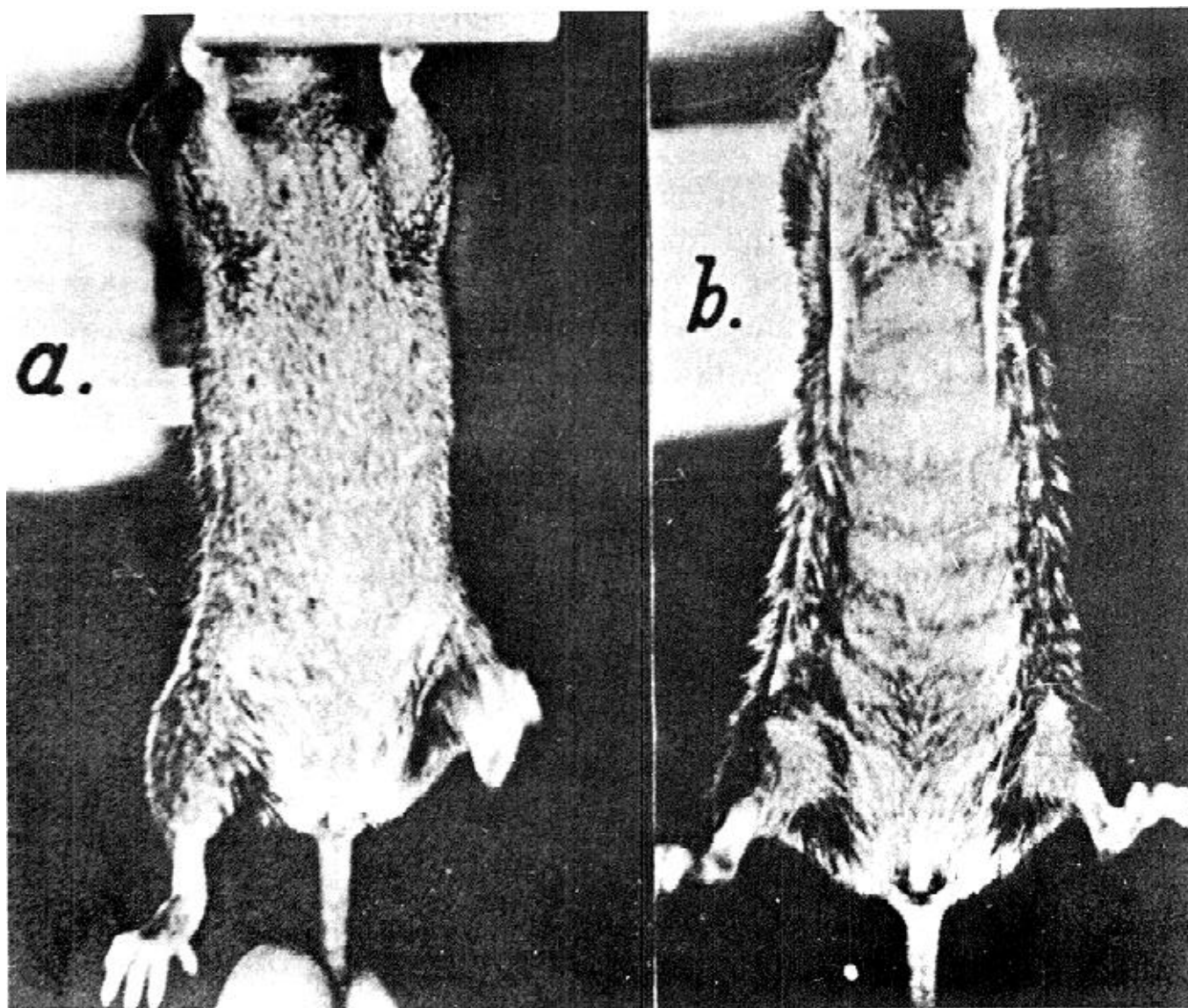


Figure 1. C-3H-strain female mice at an age of 400 days. (a) Treated 11 months earlier in a magnetic field of 4200 Oe; (b) control (kept in identical dummy magnet) of the same age. From Glasser, Otto, Editor. 1960. *Medical Physics*, Volume 3. Copyright © 1960 by Yearbook Medical Publishers, Inc., Chicago. Used by permission.

Summary and Interpretation

A limited hypothesis may be formed on the basis of the aforementioned data. Since the earth's magnetic field was greater in the past, then one might expect that the previously discussed magnetic phenomena were in effect in the Earth's biosphere at one time. These phenomena would cause a retardation of aging and a stabilization of the genetic code for some species while at the same time, owing to a difference in threshold values, might leave others unaffected. The proposed existence of a magnetic threshold would explain also the absence of stabilizing magnetic effects today.

References

- ¹Barnes, Thomas G. 1973. *Origin and destiny of the Earth's magnetic field*. Institute for Creation Research, San Diego, California.
- ²Barnothy, Madeline F., Editor. 1964. *Biological effects of magnetic fields*. Volume 1. Plenum Press, New York. Also Volume 2, 1969.
- ³*Ibid.*, Volume 1, pages 83-87.
- ⁴Note that 4200 Oe (oersted) is approximately 8400 times the present average strength of the Earth's magnetic field.
- ⁵Barnothy, *Op. cit.*, Volume 1, p. 84. This quotation and all following quotations are used by permission.
- ⁶*Ibid.*, p. 86.
- ⁷*Ibid.*
- ⁸*Ibid.*, pp. 86-87.
- ⁹Barnothy, *Op. cit.*, Volume 2, p. xii.
- ¹⁰*Ibid.*, cf. pp. 133-134.
- ¹¹*Ibid.*, cf. p. 75.
- ¹²*Ibid.*, cf. Table IV, p. 118.
- ¹³Barnothy, *Op. cit.*, Volume 1, p. 88. (See paragraph 5)

AN EXAMINATION OF THEISTIC EVOLUTION

H. L. ARMSTRONG*

While there are many who propose some doctrine called theistic evolution as a compromise between evolutionism and Biblical Christianity, it is by no means easy to find out what that doctrine is supposed to entail. In this article the author investigates the doctrine, with reference to scientific evidence. In fact, theistic evolution may be divided into several varieties, some of which merge with atheistic evolution or with progressive creation. None of the variations, however, is really supported by the scientific evidence; and powerful objections may be brought against each variety. The doctrine of supernatural creation in a short time is supported by the scientific evidence.

Introduction

While there have been those, such as Nilsson,¹ who rejected organic evolution just because the scientific evidence was against it, most of those who have taken a stand against it have done so because it was in conflict with the record of Creation.

There is nothing unscientific in such action. Few, if any, scientific questions can be settled with scientific evidence alone, if by scientific evidence is meant that obtained by scientific investigation and experiment. It is always necessary to use some more general information. The general information, of course, should be as reliable as possible; and the creationist believes that in the Scriptural record of Creation he has such reliable information.

Readers will, no doubt, be most familiar with the work of creationists who are Christians. There are Jewish creationists, of course;^{2,3} and Modern Creationism should be, it would seem, a logical view for a Moslem.

Theistic Evolution

As is well known, not all of those who are called Christians have taken a stand for Creation. Many, even in high places, just go along with evolution. Or, if the disagreement of evolution with Christianity becomes too sharp to be ignored, many look for some compromise. And often the compromise is called Theistic Evolution.

There is a difficulty in attempting to discuss theistic evolution, in that it is hard to get a clear statement of what is really entailed. It seems, however, to be the view that evolution happened, much as is claimed under atheistic evolution, but with the added statement that God was involved somehow.

On this basis, it is possible to divide theistic evolution into varieties, or branches.

Epicurean Theistic Evolution

Some, who call themselves theistic evolutionists, say that God was present, but are unwilling to allow that He did anything. To put it bluntly, such people hold that things evolved, while God sat and watched them. This view is rather like that ascribed to the Epicureans of old. So it might be called the Epicurean branch, or variety, of theistic evolution.

As far as scientific evidence goes, the Epicurean theistic evolution is indistinguishable from atheistic evolution. For nobody would expect that God's presence, if He actually did nothing, would be shown in the fossils, or in any other kind of scientific evidence.

Likewise, this brand of theistic evolution is open to exactly the same objections as the atheistic kind. These objections have been discussed before; it will suffice to note one at this point. The Epicurean, like the atheist, must hold that things came about by chance and natural selection. But it has been shown that the improbability that the present state of affairs could have come but by chance is enormous.^{2,4-5} So the Epicurean, like the atheist, is in conflict with all probability; and can hold his view only by claiming to believe in things which have been shown to be so improbable that they may as well be called impossible.

Intervention

Other theistic evolutionists, perhaps rightly dissatisfied with the Epicurean position, say that evolution was the means by which God created things. If God used means, He must have done something—He intervened. So those who hold this variety of theistic evolution might be called Interventionists.

Actually, the statement of what is meant here is still not very clear. Those who hold it, however, seem to mean that they believe that living things changed from one kind to another, over a considerable period of time, in the way which is claimed by atheistic evolutionists. But the Interventionists do not think that the changes from generation to generation came about by chance; they hold that God intervened to cause them.

Thus the Interventionist is logically better off in one respect, at least. He is not committed to belief in improbable events, at least not so simply. For very improbable things can happen under direction, and God is considered to have intervened to direct things.

Since the actual changes are supposed to have been the same as those which atheistic evolutionists allege, and since there is a diversity of opinions among the latter, it is necessary to split this variety of theistic evolution once more.

Gradual Intervention

To the Gradual Interventionist (to invent a name), evolution is framed to agree with what seems to be the commonest view held by atheistic evolutionists. That view is, that living things changed slowly, even imperceptibly, from generation to generation, until completely new kinds of creatures had arisen.

The objection which can be advanced against gradual intervention is that there is absolutely no evidence for it. The fossil record does not show any slow, gradual, continuous change from one kind to another. Nor is any such thing happening among creatures living

*H. L. Armstrong, M. Sc., teaches Physics at Queen's University, Kingston, Ontario, Canada.

today. Neither is there a continuous variation between kinds; a continuous merging of the horse kind with the cow kind, for instance, as would be expected if those kinds had arisen gradually from some common ancestor.⁶

There are other objections. Consider the origin of birds,⁷ or more generally of flying creatures, from organisms which could not fly. If this came about gradually, there must have been many generations of creatures, neither one thing nor the other, which were not suited to any way of life, either on the ground or in the air. Of course, God could have intervened to sustain these misfits miraculously. But there are no fossils of misfits, nor evidence that the alleged misfits ever existed at all. And certainly there are no whole races of misfits being miraculously preserved today.

Again, consider the light and dark moths, so often alleged to provide evidence of evolution. Presumably, the gradual interventionist would have to maintain that God has been intervening gradually, over many years, to turn the moths dark. But now there seems to be some evidence that, pollution from smoke having decreased, the moths are becoming again predominantly light.⁸ Is it to be said, then, that God, having started a project to have dark moths, has now changed His mind?

If, on the other hand, the interventionist should say that this matter of the moths was not God's doing, but just depended on chance and selection, the atheistic evolutionist would mutter something about Ockham's Razor, and say that if the explanation without God is adequate here, it is likely so in other cases.

The Hopeful Miracle

Of course, some evolutionists, who were not theistic, have recognized the force of these objections to gradual evolution. Probably Goldschmidt is the better known; and his proposed solution, which has been called the Hopeful Monster, is also well known. It is commonly stated in the form: "once a reptile laid an egg from which a bird hatched".⁹ It is not very clear whether that statement is intended to be taken literally; but nobody seems to say how it is to be taken if not literally. In theistic evolution, such a happening would surely be a miracle; thus in that context the concept might well be called the "Hopeful Miracle".

The first thing to be noted about the "Hopeful Miracle" is that proponents have really left off being strictly evolutionists. The outlook has merged with what has been called progressive creation, at least as far as the scientific evidence is concerned.

Those who hold progressive creation believe that God indeed created things, possibly the various kinds after their kinds; but that the creation was done from time to time over a long period, certainly not in six days. Thus they hope to reconcile the Scriptural account with the alleged geological time.

Now the fossil of an animal, even supposing it to be the first of its kind, would clearly not show whether, if God created it, He created it out of nothing, or out of lifeless material, or out of the egg or embryo of some other kind of creature. So the hopeful miracle variety of theistic evolution, and progressive creation, are scientifically indistinguishable.

Objections on Scientific Grounds

There are several objections, on strictly scientific grounds, which may be brought against either of these views. First of all, it is unlikely that anyone would try to hold such ideas, if he did not believe that the Earth is very old. If it is admitted that the Earth is only a few thousand years old, creation in a short time, say six days, is the most reasonable view. Now in fact, there are many lines of evidence to show that the Earth is, in fact, far younger than is alleged by uniformitarians.¹⁰ This evidence is not well known, because of the difficulty of publishing anything which conflicts with uniformitarianism.

Another point which must be considered is the occurrence of symbiosis.¹¹ There are creatures which live together, which depend absolutely on each other. And they are often of quite different kinds. One may even be an animal, and the other a plant. This is true, for instance, of figs and wasps,¹² or of yucca and the yucca moths.¹³ Now if progressive creation is given the same order of origin as is held by evolutionists, in most cases one member of the above pairs existed long before the other. How, then, did the earlier member survive? Or, if it was able to live independently, how was symbiosis established later?

Another objection is that, in trying to make everything agree with the fossil record, progressive creationists, or others having similar views, may be leaning on a broken reed. For there are places in which fossils are in the wrong order, according to uniformitarian interpretations.

The excuse offered has been that older rocks were overthrust over younger rocks, although there was no independent evidence to show that any such event ever occurred. Besides, there are good reasons for believing that such overthrusting would be mechanically impossible.¹⁴

It would appear, then, that creatures did not, in fact, come into being in the order in which evolutionists say that they did. So the progressive creationists are trying to explain a situation which in fact has been falsely assumed to exist.

A Scriptural Objection

I have tried, so far, to discuss theistic evolution strictly in terms of scientific evidence. As for progressive creation, however, with which one variety of theistic evolution was seen to merge, there is also a Scriptural argument to be considered.

Those who believe in progressive creation commonly maintain that creation, from time to time, over perhaps many millions of years, can be made to agree with both the Scriptural record of six days and with the uniformitarian interpretation of the fossils. But in fact, the fossil record does not agree well with the alleged evolution and diversification of living beings from the so-called simple to complex. Dr. John N. Moore has prepared charts, which, along with a commentary, are given immediately after this article, showing just how poorly the fossil record agrees with the alleged evolution and diversification of living things. But now consider also the point from Scripture.

As it is usually interpreted, the fossil record shows, not only that new creatures came into being from time to time, but also that some kinds disappeared. The dinosaurs, for instance, are considered to have become extinct rather suddenly. If, then, the hopeful miracle, or progressive creation, is to be ascribed to God's intervention, it is surely logical to ascribe the disappearance of creatures to the same Cause. In other words, one should then ascribe to God progressive creation and annihilation. (Or would the annihilation be retrogressive?)

Now there is no mention of any such annihilation in Scripture except in one case: the Flood. But to make progressive creation agree with evolutionary thinking would surely require a half-dozen or so annihilations, of which there is no hint in Scripture.

Maybe the last statement should be qualified slightly. There are, it is true, those who believe that another annihilation is hinted at in Scripture: the gap which some think comes between Genesis 1:1 and 1:2. But be that as it may, nobody has ever claimed that there are a half-dozen or so gaps.

Besides, it has been shown that one Creation, along with one annihilation, that which occurred at the time of the Flood, are enough to account for the fossil record and the other evidence. The proper scientific attitude to take, then, is to apply Ockham's Razor, which is the principle that causes should not be multiplied needlessly. One Creation and one annihilation will account for the evidence; why strive to invent more?

Conclusion

It has been shown that of the varieties of theistic evolution, one, the Epicurean, coincides with atheistic evolution as far as the scientific evidence is concerned. Another, the Hopeful Miracle, is synonymous with pro-

gressive creation. For some of the varieties which have been proposed there is really no evidence, and there are strong objections to all variations. This is true even on scientific grounds, and it is highly unlikely that anyone would even think of theistic evolution on primarily theological or Scriptural grounds. So the most believable account of the origin of things is the Scriptural one, of Creation in a relatively short time, a few thousand or so years ago.

References

- ¹Nilsson, H. 1953. *Synthetische Artbildung*. Verlag C. W. K., Gleerup.
- ²Trop, Moshe 1975. Was evolution really possible?, *Creation Research Society Quarterly* 11(4):183-187.
- ³Ben Uri, M. 1975. Interest in Creation week and in the Flood in Israel, *Creation Research Society Quarterly* 12(2):83.
- ⁴Rodabaugh, David J. 1975. Mathematicians do it again, *Creation Research Society Quarterly* 12(3):173-175.
- ⁵Coppedge, James F. 1973. *Evolution: possible or impossible?* Zondervan Publishing House, Grand Rapids, Michigan.
- ⁶Davidheiser, Bolton 1975. Horse brain, cow brain, *Creation Research Society Quarterly* 12(2):88-89.
- ⁷Cousins, Frank W. 1971. The alleged evolution of birds (*Archaeopteryx*) (in) *A symposium on Creation III*, Edited by Donald W. Patten. Baker Book House, Grand Rapids, Michigan, pages 89-99.
- ⁸Bishop, J. A., and Laurence M. Cook 1975. Moths, melanism, and clean air, *Scientific American* 232(1):90-99.
- ⁹Goldschmidt, R. B. 1940. *The material basis of evolution*. Yale University Press. See especially pages 390-395.
- ¹⁰Morris, Henry M. 1975. The young Earth, *Creation Research Society Quarterly* 12(1):19-22.
- ¹¹Kaufmann, David A. 1975. Symbiosis, *Bible-Science Newsletter*, September, page 2.
- ¹²Brauer, Oscar L. 1972. The Smyrna fig requires God for its production, *Creation Research Society Quarterly* 9(2):129-131.
- ¹³Keithley, Willis E. 1972. The yucca and its yucca moth, *Creation Research Society Quarterly* 8(4):228.
- ¹⁴Burdick, Clifford L. 1975. Geological formations near Loch Assynt compared with the Glarus formation, *Creation Research Society Quarterly* 12(3):155-156.

DOCUMENTATION OF THE ABSENCE OF TRANSITIONAL FORMS

JOHN N. MOORE*

Clear documentation of the position that there are no transitional forms, and no diversification and branching from general to special, is available in the 1967 publication, *The Fossil Record* (A Symposium with Documentation), jointly sponsored by the Geological Society of London and the Palaeontological Association of England. Attention to this thoroughly scientific work resulted from the suggestion of Father Vincent J. O'Brien, former science master at Castlenock College, County Dublin, Ireland, and past Chairman of the Association of Irish Teachers of Science.

In this research volume, some 120 scientists, all specialists, prepared 30 chapters in a monumental work of over 800 pages to present the fossil record for plants and animals divided into about 2,500 groups. Also these specialists prepared 71 highly instructive and authoritative charts that are included throughout the chapters of the book. (See Charts 1 and 2.)

*John N. Moore, M.S., Ed.D., is Professor of Natural Science, Michigan State University, East Lansing, Michigan 48824.

Acknowledgement is made in the Introduction of Part II (p. 158) of the fact that some zoological specialists attempted to indicate possible limited "connections", but such tenuous relationships always involved possible "connections" within major divisions of animals, viz. Porifera, Brachiopoda, Mollusca, Agnatha, Amphibia, Aves, Mammalia. No such limited "connections" were recorded by any botanical specialist.

However, a conclusive generalization drawn from these charts is as follows: Each major form or kind of plant and animal is shown to have a separate and distinct history from all the other forms or kinds!!!

Groups of both plants and animals appear suddenly in the fossil record. For example, most mammals appear suddenly in the so-called Eocene division, and are as diverse then as researchers find them to be today. Whales, bats, horses, primates, elephants, hares, squirrels, etc., are all as distinct at their first appearance as they are now. There is not a trace of a common ancestor, much less a link with any reptile, the supposed

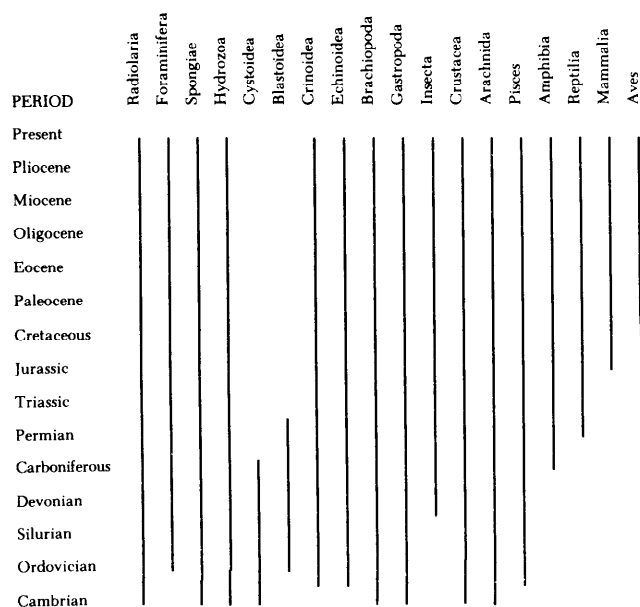


Chart 1. Generalized Geological Record of Animals. Vertical lines represent duration of each animal group. No common ancestors are known. (Based on Harland, W. B., and others, Editors. The fossil record. London: Geological Society, 1967.) (After O'Brien.)

progenitor; and the same is true of the *sudden* appearance of about 50 families of flowering plants in the so-called Cretaceous division of the accepted geological time scale.

Many summary paragraphs could be included here on the outstanding scientifically documented information about plants and animals in the fossil record. But the important point to make is that knowledge of the content of the above cited book is not recent.

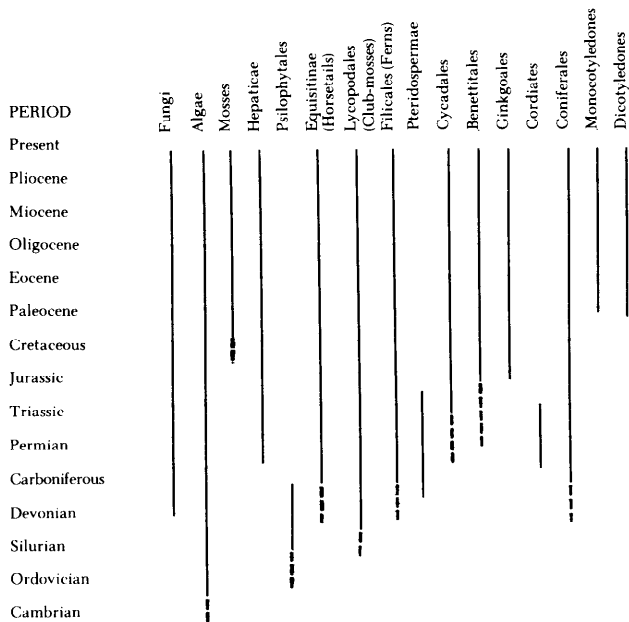


Chart 2. Generalized Geological Record of Plants. Solid vertical lines represent duration of existence of each plant group. Broken line portions indicate some doubts as to earliest appearance of some groups. No common ancestors are known. (Based on Harland, W. B., and others, Editors. The fossil record. London: Geological Society, 1967.)

Specialists in the proper fields have possessed most of these facts for decades. And proponents of the General Evolution Model, who are familiar with the facts of paleontology, admit existence of gaps between *all* higher categories. They admit that this is an undeniable fact of the fossil record.

FLEEMING JENKIN'S CRITIQUE OF DARWIN'S *ORIGIN OF SPECIES*

HILBERT R. SIEGLER*

Darwin's Origin of Species created a considerable controversy at the time of publication. One scientist who disagreed with Darwin was Fleeming Jenkin. His critique of origin of species through natural selection is here quoted at length, since his arguments have never been adequately refuted.

Using the work of breeders with pigeons, cattle, horses, dogs, and roses, Jenkin pointed out how through selective breeding the different species of plants and animals will at first demonstrate considerable variability. The rate of variation in a given direction, however, is a constantly diminishing rate, tending to a limit. Darwin attempted to bypass this weakness in his theory by resorting to vast lapses of time. Jenkin insisted that if man through careful manipulation was unable to overcome this natural tendency of species to reach a limit beyond which they show variability, time, no matter how vast, would be equally ineffective.

Modern day geneticists have to date not provided the evolutionists with a sound refutation to the objections raised by Jenkin. Even the allopatric theory, i.e., the theory that evolution occurred among small isolated groups, fails to do this.

The original publication of *Origin of Species* incited many debates in the scientific world, both pro and con Darwin's theory. Some of the most cogent scientific objections to the theory were recently reviewed by Hull.¹ While some scientists raised objections to the theory

which were later disclaimed by their contemporaries, several critics pointed out fallacies in the theory of natural selection which I believe have never been satisfactorily refuted. One such critic was Fleeming Jenkin.²

Henry Charles Fleeming Jenkin (1833-1885) was a professor of engineering at Glasgow. He was also an inventor, with 35 British patents in his name. In 1865 he was elected a fellow to the Royal Society of London,

*Hilbert R. Siegler is Chief of Game Management and Research in the Fish and Game Department of the State of New Hampshire, Box 2003, 34 Bridge Street, Concord, New Hampshire 03301.

and in 1869 to the Royal Society of Edinburgh, becoming vice-president in 1879. His review of Darwin's theory will be quoted at some length, since many of his comments seem as pertinent today as they were when originally presented.

Darwin later acknowledged that he had modified some of his opinions substantially after reading Jenkin. After reviewing Jenkin's arguments I believe Darwin's modifications should have been considerably more substantial.

Variability.—Darwin's theory requires that there shall be no limit to the possible difference between descendants and their progenitors, or, at least, that if there be limits, they shall be at so great a distance as to comprehend the utmost differences between any known forms of life. The variability required, if not infinite, is indefinite. Experience with domestic animals and cultivated plants shows that great variability exists. Darwin calls special attention to the differences between the various fancy pigeons, which, he says, are descended from one stock; between various breeds of cattle and horses, and some other domestic animals. He states that these differences are greater than those which induce some naturalists to class many specimens as distinct species. These differences are infinitely small as compared with the range required by his theory, but he assumes that by accumulation of successive differences any degree of variation may be produced; he says little in proof of the possibility of such an accumulation, seeming rather to take for granted that if Sir John Sebright could with pigeons produce in six years a certain head and beak of say half the bulk possessed by the original stock, then in twelve years this bulk could be reduced to a quarter, in twenty-four to an eighth, and so further. Darwin probably never believed or intended to teach so extravagant a proposition, yet by substituting a few myriads of years for that poor period of six years, we obtain a proposition fundamental in his theory. That theory rests on the assumption that natural selection can do slowly what man's selection does quickly; it is by showing how much man can do, that Darwin hopes to prove how much can be done without him. But if man's selection cannot double, treble, quadruple, centuple, any special divergence from a parent stock, why should we imagine that natural selection should have that power? When we have granted that the 'struggle for life' might produce the pouter or the fantail, or any divergence man can produce, we need not feel one whit the more disposed to grant that it can produce divergences beyond man's power. The difference between six years and six myriads, blinding by a confused sense of immensity, leads men to say hastily that if six or sixty years can make a pouter out of a common pigeon, six myriads may change a pigeon to something like a thrush; but this seems no more accurate than to conclude that because we observe that a cannon-ball has traversed a mile in a minute, therefore in an hour it will be sixty miles off, and in the course of ages that it will reach the fixed stars. This really might be the conclusion drawn by a savage seeing a cannon-ball shot off by a power the nature of which was wholly unknown to him, . . . Even so do the myriads of years confuse our speculations, and seem to remove natural selection from man's selection; yet, Darwin would be the first to allow, that the same laws probably or possibly govern the variation, whether the selection be slow or rapid. If the intelligent savage were told, that though the cannon-ball started very fast, it went slower and slower every instant, he would probably conclude that it would not reach the stars, but presently come to rest like his stone and arrow. Let us examine whether there be not a true analogy between this case and the variation of domestic animals.

We all believe that a breeder, starting business with a considerable stock of average horses, could, by selection, in a very few generations, obtain horses able to run much faster than any of their sires or dams; in time perhaps he would obtain descendants running twice as fast as their ancestors, and possibly equal to our race-horses. But would not the differences in speed between each successive generation be less and less? Hundreds of skillful men are yearly breeding thousands of racers. Wealth and honor await the man who can breed one horse to run one part in five thousand faster than his fellows. As a matter of experience have our racers improved in speed by one part in a thousand during the last twenty generations? Could we not double the speed of a cart-horse in twenty generations? Here is the analogy with our cannon-ball; the rate of variation in a given direction is not constant, is not erratic; it is a constantly diminishing rate, tending therefore to a limit.

It may be urged that the limit in the above case is not fixed by the laws of variation but by the laws of matter; that bone and sinew cannot make a beast of the racer size and build go faster. This would be an objection rather to the form than to the essence of the argument. The existence of a limit, as proved by the gradual cessation of improvement, is the point which we aim at establishing. Possibly in every case the limit depends on some physical difficulty, sometimes apparent, more often concealed; moreover, no one can *a priori* calculate what bone and sinew may be capable of doing, or how far they can be improved; but it is unnecessary further to combat this objection, for whatever be the peculiarity aimed at by fancy-breeders, the same fact recurs. Small terriers are valuable, and the limit below which a terrier of good shape would be worth its weight in silver, perhaps in gold, is nearly as well fixed as the possible speed of a race-horse. The points of all prize cattle, of all prize flowers, indicate limits. A rose called 'Sena-teur Vaisse' weighs 300 grains, a wild rose weighs 30 grains. A gardener, with a good stock of wild roses, would soon raise seedlings with flowers of double, treble, the weight of his first briar flowers. He or his grandson would very slowly approach the 'Cloth of Gold' or 'Sena-teur Vaisse', and if the gradual rate of increase in weight were systematically noted, it would point with mathematical accuracy to the weight which could not be surpassed.

We are thus led to believe that whatever new point in the variable beast, bird or flower, be chosen as desirable by a fancier, this point can be rapidly approached at first, but that the rate of approach quickly diminishes, tending to a limit never to be attained. Darwin says that our oldest cultivated plants still yield new varieties. Granted; but the new variations are not successive variations in one direction. Horses could be produced with very long or with very short ears, very long or short hair, with large or small hooves, with peculiar color, eyes, teeth, perhaps. In short, whatever variation we perceive of ordinary occurrence might by selection be carried to an extravagant excess. If a

large annual prize were offered for any of these novel peculiarities, probably the variation in the first few years would be remarkable, but in twenty years' time the judges would be much puzzled to which breeder the prize should fall, and the maximum excellence would be known and expressed in figures, so that an eighth of an inch more or less would determine success or failure.

A given plant or animal appears to be contained, as it were, within a sphere of variation; one individual lies near one portion of the surface, another individual, of the same species, near another part of the surface; the average animal at the center. Any individual may produce descendants varying in any direction, but is more likely to produce descendants varying towards the center of the sphere, and the variations in that direction will be greater in amount than the variations towards the surface. Thus, a set of racers of equal merit indiscriminately breeding will produce more colts and foals of inferior than of superior speed, and the falling off of the degenerate will be greater than the improvement of the select. A set of Clydesdale prize horses would produce more colts and foals of inferior than superior strength. More seedlings of 'Seneur Vaisse' will be inferior to him in size and color than superior. The tendency to revert, admitted by Darwin, is generalized in the simile of the sphere here suggested. On the other hand, Darwin insists very sufficiently on the rapidity with which new peculiarities are produced; and this rapidity is quite essential to the argument now urged as subsequent slowness.

We hope this argument is now plain. However slow the rate of variation might be, even though it were only one part in a thousand per twenty or two thousand generations, yet if it were constant or erratic we might believe that, in untold time, it would lead to untold distance; but if in every case we find that deviation from an average individual can be rapidly effected at first, and that the rate of deviation steadily diminishes till it reaches an almost imperceptible amount, then we are as much entitled to assume a limit to the possible deviation as we are to the progress of a cannon-ball from a knowledge of the law of diminution in its speed. This limit to the variation of species seems to be established for all cases of man's selection. What argument does Darwin offer showing that the law of variation will be different when the variation occurs slowly, not rapidly? The law may be different, but is there any experimental ground for believing that it is different? Darwin says (p. 153), 'The struggle between natural selection, on the one hand, and the tendency to reversion and variability on the other hand, will in the course of time cease and that the most abnormally developed organs may be made constant, I can see no reason to doubt.' But what reason have we to believe this? Darwin says the variability will disappear by the continued rejection of the individuals tending to revert to a former condition; but is there any experimental ground for believing that the variability will disappear; and, secondly, if the variety can become fixed, that it will in time become ready to vary still more in the original direction, passing that limit which we think has just been shown to exist in the case of man's selection? It is peculiarly difficult to see how natural selection could reject individuals having a tendency to produce offspring reverting to an original stock. The tendency to offspring more like their superior parents than their inferior grandfathers can surely be of no advantage to any individual in the struggle for life. On the contrary, most individuals would be benefited by producing imperfect offspring, competing with them at a disadvantage; thus it would appear that natural selection, if it select anything, must select the most perfect individuals, having a tendency to produce the fewest and least perfect competitors; but it may be urged that though the tendency to produce good offspring is injurious to the parents, the improved offspring would live and receive by inheritance the fatal tendency of producing in their turn parricidal descendants. Yet this is contending that in the struggle for life natural selection can gradually endow a race with a quality injurious to every individual which possesses it. It really seems certain that natural selection cannot tend to obliterate the tendency to revert; but the theory advanced appears rather to be that, if owing to some other qualities a race is maintained for a very long time different from the average or original race (near the surface of our sphere), then it will in time spontaneously lose the tendency to relapse, and acquire a tendency to vary outside the sphere. What is to produce this change? Time simply, apparently. The race is to be kept constant, to all appearance, for a very long while, but some subtle change due to time is to take place; so that, of two individuals just alike in every feature, but one born a few thousand years after the other, the first shall tend to produce relapsing offspring, the second shall not. This seems rather like the idea that keeping a bar of iron hot or cold for a very long time would leave it permanently hot or cold at the end of the period when the heating or cooling agent was withdrawn. This strikes us as absurd now, but Bacon believed it possibly true. So many things may happen in a very long time, that time comes to be looked on as an agent capable of doing great and unknown things. Natural selection, as we contend, could hardly select an individual because it bred true. Man does. He chooses for sires those horses which he sees not only run fast themselves, but produce fine foals. He never gets rid of the tendency to revert. Darwin says species of pigeons have bred true for centuries. Does he believe that it would not be easier by selection to diminish the peculiarities of the pouter pigeon than to increase them? And what does this mean, but that the tendency to revert exists? It is possible that by man's selection this tendency may be diminished as any other quality may be somewhat increased or diminished, but, like all other qualities, this seems rapidly to approach a limit which there is no obvious reason to suppose 'time' will alter.

But not only do we require for Darwin's theory that time shall first permanently fix the variety near the outside of the assumed sphere of variation, we require that it shall give the power of varying beyond that sphere. It may be urged that man's rapid selection does away with this power; that if each little improvement were allowed to take root during a few hundred generations, there would be no symptom of a decrease of the rate of variation, no symptom that a limit was approached. If this be so, breeders of race-horses and prize flowers had better change their tactics; instead of selecting the fastest colts and finest flowers to start with, they ought to begin with very ordinary beasts and species. They should select the descendants which might be rather better in the first generation, and then should care-

fully abstain from all attempts at improvement for twenty, thirty, or one hundred generations. Then they might take a little step forward, and in this way, in time, they or their children's children would obtain breeds far surpassing those produced by their overhasty competitors, who would be brought to a stand by limits which would never be felt or perceived by the followers of the maxim, *Festina lente*. If we are told that the time during which a breeder or his descendants could afford to wait bears no proportion to the time used by natural selection, we may answer that we do not expect the enormous variability supposed to be given by natural selection, but that we do expect to observe some step in that direction, to find that by carefully approaching our limit by slow degrees, that limit would be removed a little further off. Does any one think this would be the case?

There is indeed one view upon which it would seem natural to believe that the tendency to revert may diminish. If the peculiarities of an animal's structure are simply determined by inheritance, and not by any law of growth, and if the child is more likely to resemble its father than its grandfather, its grandfather than its great-grandfather, etc., then the chances that an animal will revert to the likeness of an ancestor a thousand generations back will be slender. This is perhaps Darwin's view. It depends on the assumption that there is no typical or average animal, no sphere of variation, with center and limits, and cannot be made use of to prove that assumption. The opposing view is that of a race maintained by a continual force in an abnormal condition, and returning to that condition so soon as the force is removed; returning not suddenly, but by similar steps with those by which it first left the average state, restrained by the tendency to resemble its immediate progenitors. *A priori*, perhaps one view is as probable as the other; or in other words, as we are ignorant of the reason why atoms fashion themselves into bears and squirrels, one fancy is as likely to meet with approval as another. Experiments conducted in a limited time, point as already said to a limit, with a tendency to revert. And while admitting that the tendency to revert may be diminished though not extinguished, we are unaware of any reason for supposing that pouters, after a thousand generations of true breeding, have acquired a fresh power of doubling their crops, or that the oldest breed of Arabs are likely to produce 'sports' vastly surpassing their ancestors in speed. Experiments conducted during the longest time at our disposal show no probability of surpassing the limits of the sphere of variation, and why should we concede that a simple extension of time will reverse the rule?

The argument may be thus resumed.

Although many domestic animals and plants are highly variable, there appears to be a limit to their variation in any one direction. This limit is shown by the fact that new points are at first rapidly gained, but afterwards more slowly, while finally no further perceptible change can be effected. Great, therefore, as the variability is, we are not free to assume that successive variations of the same kind can be accumulated. There is no experimental reason for believing that the limit would be removed to a greater distance, or passed, simply because it was approached by very slow degrees, instead of by more rapid steps. There is no reason to believe that a fresh variability is acquired by long selection of one form; on the contrary, we know that with the oldest breeds it is easier to bring about a diminution than an increase in the points of excellence. The sphere of variation is a simile embodying this view;—each point of the sphere corresponding to a different individual of the same race, the center to the average animal, the surface to the limit in various directions. The individual near the center may have offspring varying in all directions with nearly equal rapidity. A variety near the surface may be made to approach it still nearer, but has a greater tendency to vary in every other direction. The sphere may be conceived as large for some species and small for others.

Modern day geneticists have not, as yet, provided the evolutionist with a sound refutation to the objections raised by Jenkin over 100 years ago.

Today, most biologists subscribe to the "allopatric theory" popularized by Ernst Mayr,³ to account for the rise of new species. Nevertheless, Jenkin's objections seem equally valid when applied to the idea that new species arise where very small populations become isolated from parental groups.

Despite all claims and efforts to the contrary, no biologist since Darwin's time has been able to develop a valid case for macro-evolution. As contended by Siegler,⁴ the Creator placed in each "kind" a tremendous potential for change and the production of varieties, always, however, *within* the limits of each "kind" or baramin.

Postscript by the Editors: Subsequent research has shown that Jenkin was quite right in his conclusions. In France, for instance, about 1800, ordinary sugar beets tested about six per cent sugar; and were the best available at the time. By 1878 through breeding and

selection the content of sugar had been raised to 17 per cent. But 40 years later it was reported that there had been no further increase in the amount of sugar content, even though the same type of selection had been continued. When one beet contains all the genes (to use an explanation which was not available to Jenkin) for high sugar content, there is nothing more which can be accomplished by selection methods directed by man.

Another example is hybrid corn. Inbred strains are built up by selection and two strains, or perhaps four strains, are crossed to get the hybrid corn for seed. If the growers desire further improvement they do not attempt the futile task of improving a given hybrid; rather they go back to open pollinated corn and breed a new hybrid.

References

- ¹Hull, David L. 1973. Darwin and his critics—the reception of Darwin's theory of evolution by the scientific community. Harvard University Press. Cambridge, Massachusetts, pp. 1-473.
- ²Jenkin, Fleeming 1867. The origin of species, *North British Review* XCII:149-171.
- ³Mayr, Ernst 1963. Animal species and evolution. The Belknap Press of Harvard University Press. Cambridge, Massachusetts.
- ⁴Siegler, Hilbert R. 1972. Evolution or degeneration—which? Northwestern Publishing House. Milwaukee, Wisconsin, p. 17.

"DARWIN'S MISTAKE"

BOLTON DAVIDHEISER*

An article, with the same title as that used here, appeared a few months ago in a well known magazine, and received considerable attention. The point argued in it was that Darwin's notion of survival of the fittest was tautologous. Here the author points out that the fact that it has been possible for such an article to be published is no reason for creationists to become complacent. Moreover, it is pointed out that there are available to creationists better lines of attack than to urge tautology. For Darwin's theory requires that there be something to be selected, that variations which amount to new species or kinds arise. But the evidence shows that nothing of the sort occurs.

The title above is that of an article by Tom Bethell, former Oxford philosopher and now editor of *The Washington Monthly*, as published in *Harper's*, February, 1976. It was reprinted under the title "Is Darwin's Theory on the Verge of Collapse?" in *Human Events*, March 13, 1976.

The author reviewed the acceptance by scientists of Darwin's natural selection theory that culminated in the Darwin Centennial at the University of Chicago.

But something has happened in the short interval between the centennial and the present. Some outstanding evolutionists, and others, have been considering seriously the idea that Darwin's natural selection theory is just a tautology, a statement repeated, an argument in a circle. They charge that there is no valid criterion for fitness. Thus in the alleged process of natural selection, or survival of the fittest, individuals judged to be the fittest are so designated on the basis of the fact that they are the ones which have survived.

Bethell maintained it should be abundantly clear that Darwin made a mistake and the mistake is fairly easy to detect. The mistake is said to be that his theory lacks a criterion whereby the fittest may be identified beforehand instead of it being necessary to wait and see which ones survive.

Moths Do Not Evolve

However, one may consider the most commonly heralded example of alleged evolution, namely the case of the peppered moths in England. Before the industrial revolution, tree trunks were light in color and the light variety of the peppered moths blended with the background, while the dark variety of the same species stood out in contrast. As a consequence, birds ate the dark moths first because they could see them so much more easily. The light moths obviously were more fit and they were the survivors.

Certainly if anyone acquainted with general biological facts had been told that, as a result of the coming industrial revolution, tree trunks in the industrialized areas would be darkened, there would have been no difficulty at all for such an individual to predict that under the new condition the dark moths would be more fit and would be the survivors. This is exactly what happened. The dark moths became the predominant type in the industrialized areas, through a process of survival of the fittest.

This is a very good example of natural selection, but it is not evolution at all. The moths are not becoming anything different. But scientists and textbook writers

hail this as an outstanding example of evolution. Dr. Kettlewell, who did the research on the moths, said that if Darwin had lived to see this, he would have witnessed the culmination of his life's work!

When ecologists put pressure on factory owners to stop polluting the air, tree trunks became light again. Then, as could have been easily predicted, the light moths again became the predominant type. Is something and its opposite *both* evolution? In cases like this neither is evolution. The changes are merely in the ratios of the two varieties of the same kind of moths, and the moths are not becoming anything else. All this merely shows that "natural selection" is not synonymous with evolution, though many evolutionists tell the public that it is.

Variation Is Limited

Thus it appears to be a fact that there *are* independent criteria for fitness in a particular environment, but evidence shows that this leads to no real evolution. It may be a truism that individuals which are better adapted to survive are the ones that tend to survive, but the question is: Do *new* varieties arise which are better adapted to survive in a particular environment than were the individuals which previously existed in that population? If such *new* variations occur and *continue* to occur in a population, it seems that natural selection is not a tautology, and a progressive sequence is to be expected.

However, centuries of animal and plant breeding, as well as careful observations in the field and in the laboratory, show that there is a limit to variation and that variation does not lead to real evolution. It is necessary when discussing these things to emphasize "real evolution," because some phenomena are commonly called evolution which are not evolution at all.

Bethell considered it to be of special importance that evolutionary theorists are not greatly bothered by the admission that Darwin's theory of natural selection is considered by some to be tautological "because they already had taken the precaution of redefining natural selection to mean something quite different from what Darwin had in mind". Actually, neo-Darwinism is defined in a number of different ways, but Bethell referred to the view that natural selection should be interpreted in terms of differential reproduction instead of in terms of the survival of the fittest. Evolutionary progress is thus to be through those which produce the largest number of offspring.

But how is this so "quite different" from Darwin's statement of natural selection, since it is the fittest that tend to produce the greatest number of offspring? Bethell admitted that this interpretation of natural

*Bolton Davidheiser, Ph.D., receives mail at Box 22, LaMirada, California 90637.

selection merely explains how horses and tigers, for example, become more (or less) numerous and not how they came about in the first place.

If Darwin's idea is accepted that by one means or another superior or more fit varieties (with respect to the environment) are continually being produced in nature, his natural selection theory is hardly to be considered a tautology. Where Darwin and modern evolutionists make their mistake is in believing that the kinds of variations which *do* occur can lead to real evolution.

Conclusion and Cautionary Note

Bethell concluded that Darwin is in the process of being discarded, though as gently as possible and with a minimum of publicity. But such a prediction may be premature. Such has been claimed before. Back in the 1920's there was much talk of the scientists' giving up their faith in Darwinism. The general public did not distinguish between scientists' faith in evolution and their faith in the Darwinian explanation of the mechanism of evolution. As a result, for several decades at least it was erroneously believed that scientists were giving up their faith in evolution. But their faith in Darwinism came back stronger than ever, as may be demonstrated by quotations from leading evolutionists.

More recently it has been said that Darwinism might be given up because of the discovery of neutral mutations, though not much is heard about this any more. Now it is said that Darwinism may be discarded because Darwin's original natural selection theory is a tautology (in spite of the alleged "quite different" interpretation of it today).

In the first place, under the terms which Darwin expressed his natural selection theory, it is not clear that it is a tautology. In the second place, it is more obvious that cases like that of the peppered moths are not evolution at all than it is that Darwin's theory is a tautology. If it does not bother evolutionists to call the case of the moths evolution, it should not bother them to accept natural selection at face value.

One thing is certain. If anyone disagrees with evolutionary theory in general and has his hopes raised by the announcement that Darwin's theory may be "on the verge of collapse," then such a person is bound to find only disappointment. Even if Darwin's theory were on the verge of collapse, and even if it did collapse altogether, this would have no more effect on evolutionists' faith in evolution now than it did in the 1920's. The fact is that evolutionists now are promoting evolution more vigorously than ever; and also they are resisting more strongly than ever those who are opposing evolution.

Added Note: The May 15, 1976 issue of *Human Events* contains an article by Stanton Evans commenting upon the *Harper's* article by Tom Bethell as well as on the article by Dorothy Nelkin on "The Science Textbook Controversies" in the April, 1976 issue of *Scientific American*. The gist of the article is favorable to creationists, and it shows that the issues raised by creationists are receiving more serious consideration in the secular press. (Added by Editor: Readers will want to give special attention to the "Letters" in the July issue of *Scientific American* in response to the Nelkin article.)

PROBABILITY AND THE MISSING TRANSITIONAL FORMS

DAVID J. RODABAUGH*

It is easily documented even from the writing of evolutionists that fossil evidence for transitional forms is missing. The purpose of this paper is to calculate the probability of this, given the assumption that evolution occurred through micromutations. The conclusion is that the transitional forms did not exist.

Introduction

By evolution is meant the molecules to man theory of evolution. The term "transitional form" is used for those supposed forms that were both intermediate and ancestral. That such forms are virtually absent from the fossil record (as discovered) is admitted by G. G. Simpson for he stated,

... continuous transitional sequences are not merely rare but are virtually absent ... Their absence is so universal that it cannot, offhand, be imputed entirely to chance, and does require some attempt at explanation, as has been felt by most paleontologists.¹

And Simpson has admitted that nowhere is there a trace of a fossil to close the gap between the horse and any presumed ancestor, and has stated,

This is true of all the thirty-two orders of mammals ... The earliest and most primitive known members of every order already have the basic ordinal characters, and in no case is an approximately continuous sequence from one order to another known. In most cases the break is so sharp and the gap so large that the origin of the order is speculative and much disputed.²

In addition, D. M. Raup and S. M. Stanley in 1971 stated, "Unfortunately, the origins of most higher categories are shrouded in mystery; commonly new higher categories appear abruptly in the fossil record without evidence of transitional forms."³

That the absence of transitional forms in the fossil record, as far as it is known, cannot be attributed entirely to chance is readily admitted by Simpson in the first quote above. This paper will prove an even stronger assertion using well known ideas from probability. The consequence is that there never were any such transitional forms.

*David J. Rodabaugh, Ph.D., is with the Department of Mathematics of the University of Missouri, Columbia, Missouri 65201. He is also an ordained minister, Pastor of the Berean Bible Church in Columbia, and is a member of the Boards of several Christian organizations, including Vice-President of Missouri Association for Creation.

The reader must then conclude that evolution proceeded by macromutation (the "hopeful monster" concept) or that evolution is false. Evolutionists have generally rejected the "hopeful monster" idea for even they cannot imagine how such a thing could happen. While limited micromutations have been observed, no macromutation has been observed that did not destroy the organism. Thus, macromutation is not an explanation at all.

1. Distributions

The basic situation is thus: Suppose there is a probability of p that when a fossil is discovered it is transitional. Suppose further that n fossils are discovered and the k of them are transitional. There are two questions that can be suggested. First, what is the probability of this event? Second, what is the probability, given n , p and k that m of the fossils are transitional for $m \leq k$?

These questions can be formalized with the help of some notation.

Definitions: Define $P(n, p, x = k)$ as the probability of exactly k successes in n trials where each success has probability p . Define $P(n, p, x \leq k)$ as the probability of k or fewer successes in n trials where each success has probability p .

The above two questions reduce to the problems of calculating $P(n, p, x = k)$ and $P(n, p, x \leq k)$. If $x \leq k$ then $x = 0$ or $x = 1$ or $\dots$ or $x = k$. It follows that

$$P(n, p, x \leq k) = \sum_{m=0}^k P(n, p, x = m). \quad (1)$$

To illustrate the above, consider the simple problem of tossing a coin. For each toss, the probability of having heads is $1/2$. The probability of tossing the coin three times and getting heads all three times is $(1/2)^3$ or $1/8$. That is $P(3, 1/2, x = 3) = 1/8$ in this situation. However, it is always the case that if a coin is tossed three times then it must come up heads no more than three times. That is $P(3, 1/2, x \leq 3) = 1$.

The situation described above is that of a *Bernoulli Trial*. It is defined as follows: If the probability of success is the same for each of n trials then the trials are said to be independent. Repeated trials which meet these conditions are called *Bernoulli Trials*.⁴

The probability of exactly k successes in n such (independent repeated) trials is⁵

$$P(n, p, x = k) = \binom{n}{k} p^k q^{n-k} \quad (2)$$

where $q = 1 - p$ and $\binom{n}{k} = \frac{n!}{k!(n-k)!}$. Because the right hand side of Equation 2 comes from the binomial expansion of $(p + q)^n$, the distribution determined by Equation 2 is called the binomial distribution.⁶

Substituting Equation 2 into Equation 1 gives

$$P(n, p, x \leq k) = \sum_{m=0}^k \binom{n}{m} p^m q^{n-m}. \quad (3)$$

Consider now the problem of the probability that the next fossil discovered would be transitional. Let t be the number of transitional forms (with respect to a certain characteristic or in general), and let N be the number of organisms which are not transitional. For example, if the characteristic under study is that of being a bird

then N is the number of birds and t is the number of organisms transitional (possessing partial wings). The probability of the first fossil being transitional is

$$p_1 = \frac{t}{t + N}. \quad (4)$$

There is, of course, no reason to expect a non-transitional form to be more or less readily fossilized than a transitional form.

Having removed the first fossil the probability that the second fossil is transitional is

$$p_2 = \frac{t-1}{t+N-1} \text{ or } p_2 = \frac{t}{t+N-1} \quad (5)$$

depending on the first one being transitional or not.

This is, technically, the problem of sampling without replacement and the binomial distribution does not exactly represent the probabilities since $p_1 \neq p_2 \dots \neq p_n$.

An example might help. Suppose there is a bag containing 30 balls that are identical except for color. Suppose further that 10 of the balls are black and 20 are white. The probability of drawing a black ball the first time is $10/30$ or $1/3$. If that ball is returned to the bag (i.e., replaced), the probability that the second ball is black is also $10/30$ or $1/3$. This is the situation represented by the binomial distribution.

If, however, the first ball is not returned (i.e., not replaced) then the probability that the second ball is black is not $1/3$. It is $9/29$ if the first were black and $10/29$ if the first were white. The hypergeometric distribution represents this situation.

However, when the total number is large, though the sampling is without replacement, the binomial distribution can be used as an approximation.⁷ In the study of fossil finds, the total number of organisms $t + N$ is at least in the billions so the binomial distribution represented by Equation 2 and Equation 3 is an excellent approximation.

Another distribution of use in this type of problem is the Poisson probability distribution defined by⁸

$$f(x) = \frac{\lambda^x e^{-\lambda}}{x!}. \quad (6)$$

When p is small and n large the Poisson function approximates the binomial. In this case $\lambda = np$ and⁹

$$P(n, p, x = k) \doteq \frac{(np)^k e^{-np}}{k!}. \quad (7)$$

(The notation $\doteq$ is used for an approximation.)

Putting Equation 7 into Equation 1 gives

$$P(n, p, x \leq k) \doteq \sum_{m=0}^k \frac{(np)^m e^{-np}}{m!}. \quad (8)$$

2. Some reasonable values for n and p

The rest of this paper is concerned with the application of the binomial and Poisson distributions to finding $P(n, p, x = k)$ and $P(n, p, x \leq k)$ where n is the number of fossils discovered, p is the ratio $t/(t + N)$ which is the probability of finding a transitional form and k is the number of transitional forms discovered. (The reader is reminded that, in this paper, transitional means both intermediate and ancestral.)

It is fairly difficult to get reliable information on the total number of fossils discovered or even the total number in particular categories.

However, Pierce Brodkorb states that there are 1760 species of fossil birds.¹⁰ Assuming an average of six fossils per species, this implies over 10,000 fossils of birds—all of which are fully winged and have feathers. Yet, to date not one fossil has been found with a wing only partly developed. Thus, for a very special characteristic (one not possessed by many organisms), 10,000 is a very conservative figure for n .

Actually, for the property of flight, a much larger figure is justified. For, there are many flying insects as well as flying bats and flying reptiles.

Other characteristics worthy of investigation are eyes, lungs, sexual reproduction, etc. In addition, there is the problem of the admitted missing evidence for transitional forms between each of the 32 orders of mammals and presumed ancestors, which were mentioned by Simpson.

Thus, it is most reasonable to assume $n = 100,000$ or $n = 1,000,000$.

In this paper, probabilities are calculated for $n = 10,000$, $n = 100,000$ and $n = 1,000,000$. Even larger values are justified but, as the reader will discover, the situation resulting from examining these figures is sufficiently embarrassing for the evolutionist.

What is a reasonable value for p ? The standard evolutionary theory is that micromutations (minute changes) account for all the variation that is observable. Thus, the number of transitional species must be exceedingly large.

Indeed, to account for birds via the supposed process of micromutations would necessitate the postulation of vast numbers of species that are both intermediate and ancestral. Furthermore, each species must be reasonably viable in order to survive long enough to give rise to some "evolved" descendent. Consequently, it would be the expectation, based on *evolutionary theory only*, that $p \geq .9$.

However, the calculations contained herein will be based on figures that are less demanding of evolutionists. The function $P(n, p, x \leq k)$ will be computed for $p = .5, .1$, and $.01$. The reader is reminded that $p = .01$ implies that there was only one transitional organism for every 99 nontransitional organisms—completely contrary to the prediction based on the evolution model. Even this, as will be seen, leads to nothing but headaches for the evolutionist.

Before closing this section, some comment should be made about values for k . Though *no transitional forms* have yet been found, the probabilities will be calculated based on $k = 0, 5$ and 10 .

To summarize, $P(n, p, x \leq k)$ will be calculated for $n = 10,000; 100,000; 1,000,000$; $p = .5; .1; .01$; $k = 0; 5; 10$. At times $P(n, p, x = k)$ will be calculated.

3. Computational Difficulties

A modern high-speed digital computer (such as the IBM 360 or IBM 370) can be used to work with nonzero numbers and absolute values within the range

$$16^{-99} \leq x < 16^{99}. \quad (9)$$

The range on the Hewlett-Packard electronic calculators (as well as some others) is

$$10^{-99} \leq x < 10^{100}. \quad (10)$$

This range is sufficient for most purposes. However, the following is easily verified using logs (all logarithms in this paper are base 10):

$$P(10,000, .5, x = 10) = 10^{-2970.802}. \quad (11)$$

If $P(n, p, x = k)$ were all that was desired, Equations 7 and 2 could be easily evaluated by logarithms.

Unfortunately, for $k = 5$ and $k = 10$, it is necessary to evaluate Equation 3 and Equation 8, each of which is the sum of numbers too small (in most cases) to be represented on any known computer or calculator. The problem is to evaluate a sum

$$S = \sum_{x=0}^k T_x \quad (12)$$

where some, or perhaps all of the T_x are not representable on either calculator or computer. Equation 12 can be rewritten as

$$S = \frac{1}{a} \sum_{x=0}^k aT_x. \quad (13)$$

No matter what the value of S , an a can be found so that

$$B = \sum_{x=0}^k aT_x \quad (14)$$

is representable on the machine. The value of $\log S$ can then be found by

$$\log S = \log B - \log a \quad (15)$$

since $aS = B$.

Furthermore, the logarithm of each term aT_x can be computed using logs and then converted to the value aT_x before being added to the partial sums of B .

The above procedure was employed on a programable Hewlett-Packard 25 to obtain the values in the next section.

4. Applications

In this section the values $P(n, p, x \leq k)$ are tabulated for the values indicated at the end of Section 2. These values are so small that it is a considerable convenience to only list the logarithms.

Although the Poisson distribution is only an approximation, values based on it are listed in Table 2.

The reader will notice that when $p = .01$ the values in the two tables differ only slightly.

It will be recalled that when the logarithm is -4557.60 , for instance, the number is $10^{-4557.60}$, about 2.5×10^{-4558} . So the probability would be indicated by a number, a decimal, having 4,557 zeros after the decimal point, and then a two. Surely that is small enough to convince anyone!

5. Conclusions

Emil Borel, the famous mathematician, said,

We may be led to set at 10^{-50} the value of negligible probabilities on the cosmic scale. When the probability of an event is below this limit, the opposite event may be expected to occur with certainty, whatever the number of occasions presenting themselves in the entire universe.¹¹

Table 1. LOG $P(n, p, x \leq k)$ based on the BINOMIAL DISTRIBUTION

	P	n = 10,000	n = 100,000	n = 1,000,000
.5	.5	-3010.30	-30103.00	-301030.00
k = 0	.1	-457.57	-4575.75	-45757.49
	.01	-43.65	-436.48	-4364.81
	.5	-2992.38	-30080.08	-301002.07
k = 5	.1	-444.42	-4557.60	-45734.34
	.01	-35.68	-423.54	-4346.86
	.5	-2976.86	-30059.56	-300976.56
k=10	.1	-433.68	-4541.85	-45713.59
	.01	-30.12	-412.99	-4331.32

In another book, he stated, "Events whose probability is extremely small never occur."¹²

Let E be the event described as follows: Assume that n fossils are discovered and no more than k (i.e., k or fewer) are transitional. Assume further that the number of transitional forms divided by the total number of organisms is p .

Now, the probability of E , denoted by $\pi(E)$ is given by

$$\pi(E) = P(n, p, x \leq k). \quad (16)$$

To date, the value for $k = 0$. That is, there are *no partly winged creatures*, etc. However, for the sake of argument, allow $k = 5$ or $k = 10$.

A consequence of the two tables and Borel's assertions is that E cannot occur.

In fact, if $n = 10,000$ then

$$\text{LOG } P(10,000, .5, x = 1000) = -1040.11. \quad (17)$$

Now,

$$P(10,000, .5, x \leq 1000) = \sum_{m=0}^{1000} P(10,000, .5, x = m) < (1000)P(10,000, .5, x = 1000). \quad (18)$$

Thus

$$\begin{aligned} &\text{LOG } P(10,000, .5, x \leq 1000) \\ &< \text{LOG } (1000) + \text{LOG } P(10,000, .5, x = 1000) \\ &= 3 - 1040.11 = -1037.11. \end{aligned} \quad (19)$$

Even this event can never occur. One is thus led to the inescapable conclusion that, if transitional forms ever occurred they were exceedingly rare. Consequently, either the present biological world got here by

Table 2. LOG $P(n, p, x \leq k)$ based on the POISSON DISTRIBUTION

	P	n = 10,000	n = 100,000	n = 1,000,000
.5	.5	-2171.47	-21714.72	-217147.24
k = 0	.1	-434.29	-4342.94	-43429.45
	.01	-43.43	-434.29	-4342.94
	.5	-2155.06	-21693.31	-217120.83
k = 5	.1	-421.37	-4325.02	-43406.53
	.01	-35.49	-421.37	-4325.02
	.5	-2141.04	-21674.29	-217096.81
k=10	.1	-410.85	-4309.50	-43386.01
	.01	-29.94	-410.85	-4309.50

macromutations ("hopeful monsters") or by special creation.

Since the "hopeful monster" concept is rejected by nearly all evolutionists, the unprejudiced mind must conclude that special creation is the only model that fits the facts.¹³

Another remark is that the figures contained in this paper made the figures in a recent paper by this author¹³ far too kind to the evolutionist. The probabilities $P(n, p, x \leq k)$ for $k = 0$ should be substituted for $P[G|E]$ in that paper.

References

- ¹Simpson, G. G. 1944. *Tempo and mode in evolution*. Columbia University Press, New York, p. 105.
- ²*Loc. cit.*
- ³Raup, D. M., and S. M. Stanley 1971. *Principles of paleontology*. W. H. Freeman, San Francisco, p. 306.
- ⁴Hickman, Edgar P., and James G. Hilton 1971. *Probability and statistical analysis*. Intext Educational Publishers, Scranton, Pennsylvania, p. 89.
- ⁵*Ibid.*, p. 90.
- ⁶*Ibid.*, pp. 89-94, especially p. 91.
- ⁷*Ibid.*, p. 98.
- ⁸*Ibid.*, p. 100.
- ⁹*Ibid.*, p. 101.
- ¹⁰Farmer, D. S., and J. R. King, Editors. 1971. *Avian biology*, Volume I. Academic Press, New York. See chapter by Pierce Brodkorb, "Origin and Evolution of Birds", p. 21.
- ¹¹Borel, Emil 1962. *Probabilities and life*. Dover, New York, p. 28.
- ¹²Borel, Emil 1965. *Elements of the theory of probability*. Prentice-Hall, Englewood Cliffs, New Jersey, p. 57.
- ¹³Rodabaugh, D. J. 1975. *Mathematicians do it again, Creation Research Society Quarterly* 12(3):173-175.

PANORAMA OF SCIENCE

Some Observations on Observation

Observation is vital to natural science, for it is the facts, as determined by observation, which must be discussed and interpreted. It is of some interest, then, to see what actually occurs during observation. A recent study, which was critical of geologists, concluded that: "... what geologists perceive in, and remember of, rocks is not necessarily the same as what is actually there. For example... professionals... tend to remember cleavage fans as they ought to be rather than as they are."¹

In other words, observations, or what is recorded of the observations, may be affected by preconceptions.

In this, it is likely that geologists are no better and no worse than anyone else.

It is also to be noticed that there is no question of intentional deceit here; the observers really believed that they were recording what was actually there.

The importance of this point to creationists is obvious. There are few (if any) observations which really support evolution more than creation. So the creationist, if he should come across such an (alleged) observation, is entitled to ask for a reexamination, to see whether what was recorded corresponds to what was actually there.

Another Ancestor of Man Retired?

Because of most recent evidence, the alleged evolutionary family tree of man is falling to pieces. Especially, as is fairly well known by now, human fossils are claimed to have been found in Africa which are older than the alleged ancestors.

It is in view of such evidence as this that a recent article in *Nature*, in which the author, while discussing the australopithecines, expressed much doubt that they are ancestors of man at all.²

Clearly the evidence, when it is sufficiently nearly complete, supports the creationist position: that man is a special creation, and has never been anything other than man from the beginning.

No Evidence for Other Planetary Systems

It is often stated, or taken for granted, especially in semi-popular accounts, that there are very many stars having planets, something like the Solar System, here and there in space. A sober investigation, though, gives a completely different picture. The author of a recent article on the subject has admitted that: "... To date . . . no suggested extrasolar substellar mass . . . has been confirmed . . .".³ That is, there is no proof that any star, other than the Sun, has planets.

Barnard's star, of course, is commonly considered the most likely candidate for the position of centre of a system like the Solar System. For there seem to be certain irregularities in its motion, which have been interpreted as being due to planets. But, according to the article mentioned, there may be systematic errors involved.

Possible Evidence That Saturn's Rings Are Young

N. Dupuis, Professor of Astronomy at Queen's University around the turn of the century, in his book on astronomy, mentioned that Saturn's rings are commonly considered to be divided into three divisions, of which the innermost is called "crepe". He remarked also that the particles, of which the rings are composed, must collide with one another now and then; and that the net result would be to move them closer to the planet. He also stated:

Sir Wm. Herschell, the foremost astronomical observer of his time (1738-1822), makes no mention of the crepe ring in any of his writings, and it is inferred that it was not then a conspicuous object. If this inference be correct, we must conclude that this ring is rapidly growing, and that the rings of Saturn are probably comparatively recent introductions to the solar system.⁴

Maybe this hint is worth following up. There must be photographs of the rings going back for 70 years or so. It should be possible to compare the densities of the different parts, maybe with a densitometer, and to see whether there is any evidence that the innermost ring is becoming more pronounced.

Possible Evidence from Mexico Concerning Chronology

Irwin, in a book on the prehistory of the Western Hemisphere, has collected some information which

may be of more general interest in connection with chronology.⁵

Ixtlilxochitl, a learned man among the Mexican Indians in the sixteenth century, learned Spanish and the European learning. He wrote a book, *Relaciones*, in which he set forth some of the beliefs and legends of his people.

He divided the course of the world into several ages. The first, extending from creation, lasted for 1,716 years, and ended with floods. The time given is quite close to that from the Creation to the Flood according to a straightforward reading of Genesis. The second age featured giants, and ended with earthquakes. Giants, of course, are mentioned in Genesis. The third age was given specifically to humans, and in it were set such stories as that of Quetzalcoatl. (Irwin, pp. 61 and 62.)

In another place (pp. 114 and 115), Irwin discussed the Mayan calendar. It seems to start (at least theoretically) from a date around 3,000 or 4,000 B. C. Such a date, of course, is around that of Creation according to a straightforward reading of Genesis.

It was stated that the Mayan calendar seems actually to have come into use around 600 B. C. This date is fairly close to the "watershed date", as it might be called, of Greek history, the First Olympiad, 776 B. C. One may wonder whether there is some connection.

Possible Evidence from Babel

One need not believe in astrology as a fortune-telling device to admit that there may be embedded in such lore some information about what people once thought and believed.

A book on alchemy includes mention of something about the Zodiac.⁶ (The author maintains that the common view of the aim of alchemy is a complete misunderstanding of the true purpose. But this thesis, while interesting, does not affect the present argument.)

What is to the present point is the suggestion that the interpretation of the Zodiac, common in astrology, gives evidence of having been established about 2,000 B. C. For the relations, it is maintained, fit in with the appearance of the heavens then.

Now, according to a straightforward interpretation of Biblical chronology, the building of the Tower of Babel would have occurred a little before 2,000 B. C. Moreover, it is often supposed, presumably because of Genesis 11:4, that the Tower was associated with astrology, and related activities, in some way. So if the interpretations of astrology, as they are stated today, go back to its beginning, this all fits together.

Mental, Physical Abilities of New Babies

The author of a recent article in a popular magazine⁷ has pointed out that new-born babies are by no means inert, or undeveloped as to senses. The information given there may be of interest in conjunction with the article, elsewhere in this issue of the *Quarterly*, about the nature and state of the foetus.

It is reported, in fact, that new-born babies have reasonably, acute perception almost immediately. "When a mere nine minutes old, an infant prefers a human face to a head-shaped outline." The fact that this preference

is previous to any experience may be of much interest to philosophers, who have long discussed to what extent human notions are due to experience, and to what extent they are innate.

Very young babies, it is reported, also recognize the human voice, at least as contrasted with other sounds. They also can distinguish colors and shapes very early, and have quite acute senses of taste and smell.

It must be recognized, of course, that there is much variation among new-born babies, just as adults differ widely in the amount of notice which they seem to take of things.

The implications of these findings for the care of young infants are obvious, but it would be going beyond the field of the *Quarterly* to discuss them here. However, all of this is certainly more evidence to show that human beings are "fearfully and wonderfully made".

— Contributed by H. L. Armstrong

More Evidence of Design: The Atmospheric Balance of Oxygen

Prof. J. E. Lovelock, an authority on atmospheric chemistry, is reported to have said, at a Chemical Congress at Glasgow, that an increase of only one per cent in the proportion of oxygen in the atmosphere might "turn the Earth into a tinderbox".⁸ An increase to 30 per cent oxygen, from the present approximately 21, would bring about a situation in which: "... grass and forest fires would be overwhelming holocausts, and lightning would always provide a source of ignition. Before long, all standing vegetation on land surfaces would disappear."

What seemed puzzling, it was said, is that, while the oxygen associated with the photosynthetic cycle should be in balance, oxidation of minerals in rocks, etc., would be expected to make the proportion of oxygen in the atmosphere decrease. But there is no evidence that it has decreased.

Two points may be taken from this. First, these conclusions certainly run counter to the notion sometimes expressed, that once the atmosphere contained no oxygen at all. As is well known, such a condition is included in some theories of the evolution of life, but there is no evidence at all that it ever actually existed.

In the second place, it is only in conjunction with a belief in a very old Earth that this matter of the removal of oxygen by oxidation causes any trouble. If it is admitted that the Earth is young, the oxidation need cause no concern.

— Contributed by Douglas E. Cox

More About the Greenhouse Effect on Venus

Richard Goody reports⁹ that radio emission from the surface of Venus and infra-red thermal emission from the tops of the clouds both show a difference of temperature of less than two per cent of the mean between the equator and the poles. For the Earth the difference is about 15 per cent.

He is also forced to conclude that the Earth and Venus differ in that only the Earth has the physical conditions necessary to produce heavy precipitation of condensable constituents.

Both of these points, it is interesting to note, were anticipated and discussed in detail by Donald Patten in his work on the Earth's antediluvian greenhouse effect.^{10, 11}

— Contributed by William Thompson

Grasse' Against Mutation-Selection Theory

In the 1975 *Evolution* journal, the late Theodosius Dobzhansky has a review of a book by Pierre P. Grasse'.¹² The book, written in French, deals with the question: "Darwinian or 'Oriented' Evolution?"¹³ Dobzhansky begins the review by saying,

The book of Pierre P. Grasse' is a frontal attack on all kinds of "Darwinism". Its purpose is "to destroy the myth of evolution as a simple, understood, and explained phenomenon", and to show that evolution is a mystery about which little is, and perhaps can be known . . . Grasse' . . . is the most distinguished of French zoologists.

It appears that Grasse' argues at length against the evolutionary concept that chance mutations and natural selection could have combined to yield this diverse biosphere. Dobzhansky says,

Grasse' dusts off the ancient objection that complex organs, such as the eyes of vertebrates, have too many interdependent parts which must all be simultaneously present to make the organ functional.

Dobzhansky seems to think that evolutionists answered this objection a long time ago. He acknowledges that Grasse', "perhaps better than anyone else" knows of the variety of light receptors starting with photosensitive cells. Obviously, Grasse' does not believe that this knowledge affects his argument against chance and natural selection producing the vertebrate eye.

Grasse' is an evolutionist, and having rejected mutations and natural selection he says that the real causes of evolution have not yet been discovered. He recognizes that in order to evolve something really new, new genes would have to be added. He obviously did not accept the hypothesis Dobzhansky sets forth that duplication and subsequent differentiation are creative of new genes.

Moreover in order for something really new to evolve, the new genes would have to be added in a certain sequence needed to achieve a certain result. Interestingly, he seems to believe that no new genes are being added at the present time. I think he views evolution primarily as a past phenomenon.

Dobzhansky accuses Grasse' of rejecting all that is known about evolution, appealing to some wonderful future discovery to explain everything, and of going contrary to sound scientific method. This is to be expected from an ardent, biased defender of the mutation-selection theory. Dobzhansky is most disturbed by the sentence Grasse' ends his book with, "It is possible that in this domain biology, impotent, yields the floor to metaphysics."

The stronghold of evolutionists would have to look upon Grasse' as a "rejector of the faith". Ernst Mayr has claimed that there are no arguments going on at the present that touch upon the basic principles of the modern synthetic evolutionary theory.¹⁴ In other words, Mayr has decided that anyone who disagrees with that

theory is not competent to argue about it—even if he happens to be the most distinguished French zoologist.

— Contributed by Allen B. Cornell

References

- ¹Chadwick, P. K. 1975. A psychological analysis of observation in geology, *Nature* 256(5518):570-573.
²Oxnard, C. E. 1975. The place of australopithecines in human evolution: grounds for doubt?, *Nature* 258(5534):389-395.
³Gatewood, George 1976. On the astronomic detection of neighboring planetary systems, *Icarus* 27(1):1-12.
⁴Dupuis, N. F. 1910. The elements of astronomy. Uglow and Co., Kingston, Ontario, Canada, pages 166 and 167.
⁵Irwin, Constance 1963. Fair gods and stone faces. St. Martin's Press, New York.
⁶Burckhardt, Titus 1967-1971. Alchemy. (Translated from the Ger-

man by William Stoddart.) Penguin Books, Inc., Baltimore, Maryland, pages 87-89.

⁷Lake, Alice 1976. New babies are smarter than you think, *Women's Day*, June, p. 22.

⁸*The Kitchener-Waterloo Record*, Kitchener, Ontario, Canada. 21 April 1976, page 7.

⁹Goody, R. 1973. Weather on the inner planets, *New Scientist* 58 (849):602-605.

¹⁰Patten, D. W. 1966. The Biblical flood and the ice epoch. Pacific Meridian Publishing Co., Seattle.

¹¹Patten, D. W. 1970. The pre-flood greenhouse effect (in) A symposium on Creation II. Baker Book House, Grand Rapids, Michigan, pages 11-41.

¹²Dobzhansky, Theodosius. 1975. (Book Review) Darwinian or "oriented" evolution?, *Evolution* 29:376-378.

¹³Grasse, Pierre P. 1973. L'évolution du vivant. Editions Albin Michel, Paris.

¹⁴Mayr, Ernst. 1970. Populations, species, and evolution. Harvard University Press, Cambridge, p. 7.

BOOK REVIEWS

Biomechanics by R. McNeill Alexander. 1975. Chapman and Hall, London. 62 pages. £ 1.30 (about \$2.50.)

Reviewed by H. L. Armstrong*

This little book is one of a series, "Outline Studies in Biology". It deals with mechanical and related problems which arise in the consideration of the working of living beings.

Topics include the structure of biological materials, such as resalin, elastin, bone and wood fibre, and the use of such materials in structures which must withstand or exert forces. Such structures include especially the legs of animals. Fleas and such insects, it is pointed out, use resalin so that their legs have an action rather like that of a catapult.

Then there is something more general about the locomotion of animals. Walking or running, swimming, and flying are all considered. Much information about the efficiency of the various means of locomotion is presented.

There are some special considerations about what might be called internal matters. These include the lubrication of joints, the flow of blood, and what goes on in the lungs, where surface tension turns out to play an important part.

There is something about plants, especially about the rise of sap, and the opening and closing of stomata. The aerodynamics of "winged" seeds, such as those of the maple, are given a surprisingly long treatment.

As well as treatment of complete organisms, there is something about individual cells. In particular, the action of cilia and flagella, the mechanics of the division of cells, and the nature of cell membranes, are discussed.

This work would be of interest to biologists who want to know about the physical principles of what living beings do, and to teachers of science who wish to illustrate physical principles with biological examples. It would be useful also to creationists who want to point to the exceedingly complex design which is to be seen in all living beings. The author does not comment much

on this design; but, then neither do I recall seeing the word "evolution" in it.

Naturally, in so short a book the treatment is quite condensed. But there are many references for further study.

☆ ☆ ☆

Social Responsibility and the Scientist in Modern Western Society (The Robert Walley Cohen Memorial Lecture of 1970.) by Sir Ernst Chain, F.R.S.. Council of Christians and Jews, 41 Cadogan Gardens, London, S.W.3. 26 pages (No price stated, but the price is likely to be only nominal.)

Reviewed by C. E. A. Turner*

Sir Ernst Chain F.R.S., was born in Berlin in 1906. He attended school in that city and obtained the degree of Doctor of Philosophy at its University. The rise of the Nazis and the consequent racial persecution which followed, led to his migration to England in 1933, and his graduation as Doctor of Philosophy at Oxford and at Cambridge. During the period 1961-73, he occupied the chair of Professor of Biochemistry at the Imperial College of Science and Technology in the University of London.

While Sir Alexander Fleming discovered penicillin, Sir Ernst, jointly with Lord Florey, initiated work which led to the discovery of the remarkable curative properties of that substance. With Florey and Fleming he received the Nobel Prize for Physiology and Medicine in 1945. Since then he has been the recipient of numerous prizes, medals and doctorates from institutions throughout the world.

This most distinguished scientist has produced a striking body of criticism of evolutionary theories. His words are the more important because of his eminence in the relevant field of biological research. As a practising member of the Jewish faith, and a believer in the Old Testament, he is able to bring together the twin revelations of the natural and spiritual worlds, to view Truth clearly and to view it whole—without the fogs of unproved theories raised by the unbelieving.

*C. E. A. Turner, Ph.D., is Chairman of the Evolution Protest Movement. His address is The Lodge, Farm Close, Fishbourne, Chichester, Sussex, England.

This review was originally published as a supplement to a publication of the Evolution Protest Movement, and is reprinted here, in a somewhat condensed form, by permission.

*H. L. Armstrong, M.Sc., teaches Physics at Queen's University, Kingston, Ontario, Canada.

The object of the discourse is not primarily an attack on Darwinism, but to urge scientists to take a more responsible attitude in their theorising and practice. Sir Ernst states, "that science so long as it limits itself to the descriptive study of the laws of nature has no moral or ethical quality and this applies to the physical as well as the biological sciences". And further,

The main theory which has dominated thinking in the biological field for almost a century is that of the Darwin-Wallace concepts of evolution and natural selection through the survival of the fittest. This mechanistic concept of the phenomena of life in its infinite varieties of manifestations, which purports to ascribe the origin and development of all living species, animals, plants and micro-organisms, to the haphazard blind interplay of the forces of nature in the pursuance of one aim only, namely, that for the living systems to survive, is a typical product of the naive 19th century euphoric attitude to the potentialities of science, which spread the belief that there were no secrets of nature which could not be solved by the scientific approach given only sufficient time. There exist people, even today, who hold such view, but on the whole the scientists, and in particular the biologists of the 20th century, are less optimistic than their colleagues of the 19th century.

Regarding the survival of the fittest, he scornfully points out that "it is nothing but a truism, and not a scientific theory to say that living systems do not survive if they are not fit to survive". While a few random mutations in some species may give certain members a better chance to survive, he adds

To postulate, as the positivist of the end of the last century and their followers have done, that the development and survival of the fittest is entirely a consequence of chance mutations, or even that nature carries out experiments by trial and error through mutations, in order to create living systems better fitted to survive, seems to me a hypothesis based on no evidence and irreconcilable with the facts.

He states

This hypothesis wilfully neglects the principle of teleological purpose which stares the biologist in the

face wherever he looks, whether he be engaged in the study of different organs in one organism, or even of different subcellular compartments in relation to each other in a single cell, or whether he studies the interrelation and interactions of various species."

Then he adds weightily,

These classical evolutionary theories are a gross oversimplification of an immensely complex and intricate mass of facts, and it amazes me that they are swallowed so uncritically and readily, and for such a long time, by so many scientists without a murmur of protest. However, at the present time an increasing number of scientists are rapidly becoming aware of the fact that not all is well with evolutionary theories and that these are, in fact, due for a drastic revision, having been deduced on the basis of morphological and ecological considerations.

He states,

In particular, the modern knowledge of the genetic code and its function in transmitting genetic information seems quite incompatible with classical Darwinian ideas of evolution. It is inconceivable that the hundreds of nucleotide triplets of which the very large nucleic acid molecules of the chromosomes are composed, and whose sequence determines all genotypic and phenotypic properties of the proteins, both catalytic and structural, were assembled exactly in the right order by accident or by trial and error. The probability for such an event to have occurred is just too small to be seriously considered . . . The assumption of directive forces in the origin and development of vital processes becomes a necessity in any kind of interpretation."

He thinks (Desmond) Morris may be amusing in describing man as a naked ape, but that such a comparison is neither new nor original. Sir Ernst comments,

We do not need to be expert zoologists, anatomists or physiologists to recognise that there exist some similarities between apes and man, but surely we are much more interested in the differences than in the similarities. Apes, after all, unlike man, have not pro-

(Continued on page 126)

FILM STRIP KIT REVIEW

Fossils, Strata and Evolution, filmstrip and narration by John G. Read. 1975. Scientific-Technical Presentations, P. O. Box 2384, Culver City, California, 90230. \$29.95.

Reviewed by Douglas E. Cox.*

This is an excellent examination of the significance for so-called historical geology and evolution of presumed "overthrusts", and examples of wrong-order strata. The fossil content of rocks, on the assumed premise that evolution is true, is the criterion used by geologists to determine the ages of rock formations. It must follow, then, that more complex life forms would always appear in younger rocks overlying those with less complex, and thus more ancient, fossils. But this is not always the case.

Where supposedly older rocks are found resting on younger, the concept of "overthrust" has been applied to account for the wrong order of the fossils. Examples where overthrust explanations have been proposed, however, show no sign of mechanical deformation at the thrust plane. The overthrust explanation appears as a device that has been invented solely for the purpose of propping up evolutionary preconceptions.

Examples of small thrusts at Vasquez Rocks, north of Los Angeles, and at Owl's Head, in Tortillita Mountains in Arizona, show characteristic features at the thrust plane. Breccia, slickensides or striated rock surfaces seem to indicate some movement has occurred at these sites. At Santa Rita Mountains, Arizona, limestone has apparently been thrust for one-half mile producing pulverized rock in the contact zone.

Such features are absent at the thrust planes of supposed major overthrusts. In the Empire Mountains,

*Douglas E. Cox receives mail at P. O. Box 18, Petersburg, Ontario, Canada.

Arizona, Permian strata rests upon Cretaceous rock. The contact is rolling, without brecciation or any evidence of mechanical deformation. Similarly at the Franklin Mountain range, Texas, Ordovician rocks rest upon Cretaceous, without evidence of movement at the contact zone.

Physical evidence of overthrusting is absent also at Keystone Thrust, in Spring Mountains, Nevada, and along the Lewis Overthrust in Glacier Park, Montana, and in Alberta. Contact exposures of the Lewis Overthrust are shown from Crowsnest Mountain, Alberta, and at Chief Mountain, Cut Bank, Dry Fork Creek, and Marias Pass, in Glacier Park. None of these contacts at the supposed thrust plane show any physical sign of movement.

In Glacier Park the Precambrian Belt Series limestone rests upon Cretaceous shale, over an area of 12,000 square miles. The overlying rock attains a thickness of three miles, and according to the overthrust concept these rocks would have to move laterally 50 miles. In the words of the narrator:

As we examine the contact lines of the Lewis Overthrust, we find that something is greatly wrong with historical geology. The entire evolutionary time span was seen to be at stake at Glacier Park. The choice is believing that a three-mile high rock

sheet slid across these contacts, or, that the entire evolutionary time span simply never existed. These findings are far different from what is presented in the geology books. Why? If this is a time of enlightenment . . .

Evolution, the basis for historical geology, is also supposed to be proved by geologic evidence, which is circular reasoning. Geologists, it is claimed, have not been straightforward in their handling of the facts. Practices for more than 100 years have tended to approve those facts that agree with the evolutionary theory, while those findings which do not fit in with evolutionary concepts are discarded.

Flood geology is proposed as the answer to these problems of wrong order strata in evolutionary geology. It is concluded that the billions of years in the evolutionary time span simply never existed.

The filmstrip contains 114 frames, and the cassette tape narration lasts 37 minutes. A booklet is provided containing the script and suggestions for presentation, suggestions for discussion topics, and other information. This neatly packaged kit would be a stimulating aid for teachers of science in colleges and high schools. The clear presentation of the issues, extensive research, and fine photography deserve the highest commendation.

REPORT OF THE 1976 MEETING OF THE BOARD OF DIRECTORS

The annual meeting of the Board of Directors of the Creation Research Society was held at Concordia College, Ann Arbor, Michigan, beginning at 1800 hours Friday, 23 April, with a time of silent prayer. Present were: T. Barnes, E. Williams, H. Armstrong, W. Frair, C. Burdick, D. Gish, G. Howe, J. Klotz, W. Lammerts, L. Lester, J. Meyer, J. Moore, H. Morris, G. Mulfinger, W. Rusch, H. Slusher, and W. Tinkle. R. Korthals, who was absent, had informed the secretary of the circumstances preventing his attending.

The minutes of the meeting of 1975 were read and approved. The secretary reported that 116 ballots had been cast in the election, and the six candidates nominated to the Board elected. President Barnes expressed a warm welcome to the new member, Dr. Lane P. Lester.

Rusch, on behalf of Korthals, treasurer, presented the financial statement. Income for the year was \$28,011.29; total expenses, \$25,164.17. The balance in accounts on 31 March was \$41,006.87.

Rusch, membership secretary, reported a membership and subscription total of 1,911 as of early April. This is a slight decrease from the peak in 1974. However, renewals and new memberships usually continue to come in for some time.

Moore reported on the C. R. S. biology books. As of 31 March 1976 total sales have been: textbook, 42,677; teacher's guide, 2,224; student's lab manual, 8,584; teacher's manual, 2,285. Indiana recently placed the text on the official approved list.

Howe reported that about 100 copies of the anthology, *Speak to the Earth*, have been sold, as of early April. Because of rising costs, and some complaints that

the material is too technical, it is uncertain what will be done about the intended companion anthology, *Many Separate Kinds*.

Armstrong, editor of the *C. R. S. Quarterly*, reported that he hopes to maintain the *Quarterly* about the same size as in the past, viz. about 228 pages in a volume. He remarked that, because of changes in the layout and type, readers of the *Quarterly* now receive about 20 per cent more content for the same number of pages, or an increase of about 45 additional pages per year. He remarked also on his uniformly happy relations with authors.

Williams reported that during the year \$100.00 had been distributed on research projects. He showed slides and described research at Bob Jones University on the development of stalactites and stalagmites. He and Mulfinger have been working on science books, a full series of which is expected to be published by Bob Jones University Press for use in Christian schools.

Moore reported on his recent experiences at Michigan State University. He was team teaching with an evolutionist, on the subject of first origins. The class numbers about 248, and students used both creation and evolution materials.

The meeting was adjourned at 2200 hours.

The next session was called to order on Saturday, 24 April, at 0915 hours, and began with a period of silent prayer.

Moore indicated the Zondervan Publishers are satisfied with the C. R. S. biology textbook as it stands, and do not want to undertake a revision. On the other hand public school teachers are not likely to show much

interest in the present edition because of the traditional approach.

The theme chosen for the 1977 Annual Issue of the *Quarterly* is "Creationist Views of Selection, Diversification, and Extinction".

The following motions were carried:

1. That pending establishment of appropriate bylaws, Student Chapters of the C. R. S. may be established on a probationary basis with the approval of the Student Chapters Committee. (It is expected that interested individuals will take action locally to start such Chapters.)

2. That the nine persons whose names are listed elsewhere in this issue be nominated to run for the six positions on the board to begin in April 1977.

3. That Rusch be authorized to appoint an assistant membership secretary.

4. That the president appoint a committee to examine the bylaws, and to recommend such changes as are needed. (Klotz, Meyer, and Howe were appointed.)

5. That the present officers be re-elected.

6. That Dr. Frank L. Marsh be elected to the class of Fellow and that the 1976 Annual Issue be dedicated to him.

7. That Rusch be asked to investigate the proposal to establish a repository for the C. R. S. *Quarterly* at the Chung Yuan Christian College of Science and Engineering, Chung Li, Taiwan, Republic of China, and to report on the matter at our next meeting.

8. That the maximum requested funds which the Research Committee may approve by mail be raised to \$500.00.

EXCERPTS FROM THE BYLAWS

Article III - Election of Directors

Section 1. The date for the annual election of directors shall be set by the secretary, but in no case shall it be later than March 1.

Section 2. The Board of Directors shall annually nominate at least one candidate for each vacancy on the Board of Directors, said candidate to have agreed to serve on the Board of Directors. The secretary shall report the names of those nominated by the Board of Directors together with the date of the election to all voting members not less than 120 days prior to the election.

Section 3. Any voting member may nominate one candidate for election to the Board of Directors by presenting a petition signed by not less than 25 voting members of the Society, said petition to list the name and address of the candidate, indicate the qualifications of the candidate in not more than 50 words, list the name of the individual nominating him, bear the certification of the nominator as to the authenticity of the signatures on the petition, and contain a statement by the nominator that the individual nominated is willing to serve on the Board of Directors. This petition must be mailed to the secretary and must be postmarked not less than 60 days prior to the election. On receipt of the petition, the secretary shall ascertain that at least 25 of the signers of the petition are voting members in good standing.

9. That dues be increased effective September 1976, because of increased costs, as follows: voting and sustaining members, \$10.00 per year (foreign \$11.00); student members, \$5.00 per year (foreign \$6.00); organization, library, and individual subscriptions, \$13.00 per year (foreign \$14.00). (The question, whether it is desirable to have a higher cost for foreign members and subscriptions, was raised; but it was pointed out that the mailing costs are considerably greater for copies which go out of the country.)

10. That expenditure of sufficient funds to print 5,000 new two-color promotional brochures be authorized.

11. That Meyer be authorized to put advertisements for the Creation Research Society in *Christianity Today* and in *The Sword of the Lord*, up to a cost of \$750.00; and that the Promotion Committee is authorized to solicit funds for advertising the Society in the *Scientific American*, and to proceed with such advertising when sufficient funds become available. (The Promotion Committee, of course, would be interested in proposals for the support or assistance of such advertising.)

12. That Korthals, treasurer, be instructed to move \$5,000.00 from the Research Fund to the General Fund.

13. That the 1977 annual meeting of the Board be held Friday and Saturday, 22 and 23 April, at Concordia College, Ann Arbor, Michigan, beginning at 1800 hours, 22 April.

Some discussion of research followed; this is reported elsewhere in this issue.

Gish and others reported that intense interest in creationism has been shown at meetings on college campuses and elsewhere.

Meyer mentioned that there is a group of dissident scientists in Russia, who meet quite freely; and that it might be possible for any creationists who visit Russia to visit with the group.

The executive session was adjourned at 1600 hours. Informal discussion continued into the evening.

— Wayne Frair, Secretary

SPECIAL NOTICE

The following candidates have been nominated to the Board of Directors to serve for a three-year term beginning in 1977:

Harold L. Armstrong
Thomas G. Barnes
David R. Boylan
Duane T. Gish
Lane P. Lester
David J. Rodabaugh
E. Norbert Smith
William J. Tinkle
Emmett L. Williams, Jr.

Six members are to be elected to the Board. The date of the annual election is 1 March, 1977. Biographical information on each nominee will be distributed with the ballot.

LETTERS TO THE EDITOR

More Reluctance to "Retire" Piltdown Man

I read with interest the comment by R. L. Byler in the "Letters to the Editor" section of the *Quarterly* for December 1975. I think that I have even better evidence that there was no haste to sweep Piltdown under the rug.

I have a Rand McNally publication, *The Histomap of Evolution*. It was prepared by Dr. Chester A. Reeds, Curator of Geology, American Museum of Natural History, New York; Mr. Henry Field of the Chicago Museum of Natural History; and Dr. Horace Hackett Newman, Professor of Geology, University of Chicago. In the late 1960's it was sold in many museums throughout the country. It purports to provide a look at the pathway of evolution "from amoeba to man". The pathway includes a bridge between "Anthropoid Apes" and "Man". One link in this bridge is "*Eoanthropus*", or "The Piltdown Man". *Eoanthropus* is described as probably the first real man, and would have looked quite human to us except for his interlocking canine teeth and slightly protruding jaw. He shaped flints into rough scrapers of the Pre-Chellean type, examples of which were found with the skull. . . . *Eoanthropus* used fire, but was a food gatherer, eating berries and fruit, rather than a hunter.

This "map" was copyrighted originally in 1932, and re-published with a copyright renewal in 1960. The only difference between the 1932 and 1960 editions was a *small insertion* under Piltdown Man—in parentheses—"proved a hoax in 1953". I use this "map" in my classes to demonstrate that from 1932 to 1960 there were no substantially new candidates to replace "*eoanthropus*" in the bridge from ape to man. All evolutionists had in 1932 were the very suspicious "Peking Man" and "Java Man" along with "Piltdown Man". That's the best they could come up with in 1960.

Respectfully,
Preson P. Phillips, Jr., Ph.D.
Tennessee Temple Schools
1815 Union Avenue,
Chattanooga,
Tennessee 37404.



BOOK REVIEWS

(Continued from page 123)

duced great prophets, philosophers, mathematicians, writers, poets, composers, painters and scientists.

He concludes, especially regarding moral responsibility, that the scientist

would do well to recognise the limitations and fallacies in this aspect of the scientific approach, to abandon the status of intellectual superiority with which he has been vested often against his wish, by wide circles of the lay public, largely as a result of the shallow concepts of 19th century scientific philosophy, and to turn, or return, to the fundamental and lasting values of the code of ethical behaviour, forming part of the divine message, which man was uniquely privileged to receive through the intermediation of a few chosen individuals.

The Hydrological Cycle in Genesis Chapter 1

In Genesis Chapter 1 there is a beautiful expression of atmospheric convection, and the hydrological cycle.

Most translations of Genesis 1:7 really leave out some of the Hebrew. The King James, for instance, has: "And God made the firmament, and divided the waters which (were) under the firmament from the waters which (were) above the firmament: and it was so".

Berry's Interlinear renders the same verse: "And made God the expanse, and He divided between the waters which (were) (from) under (to) the expanse and (between) the waters which (were) (from) above (to) the expanse: and it was so".

Note that the King James has nothing for the "from", which in Hebrew is one letter, corresponding to "m"; nor the "to", which is one letter corresponding to "l". The "between" in brackets is just required by the Hebrew idiom.

Is the meaning, then not this? The waters from below flow upward through the expanse and the waters from above flow downward through the expanse. But this is just a description of the hydrological cycle, the convection of atmospheric vapor. Water evaporates from the surface of the Earth, and the vapor goes upward. There it eventually condenses, and returns to the surface. This is probably the first written reference to the hydrological cycle; it is mentioned again in Ecclesiastes 1:7.

Yours sincerely
David K. Blake
1350 Quartz Hill Lane
Escondido, California 92027



Anti-Evolution Literature

In answer to your questions, the following is an account, in a nutshell, of the origin and work of the International Christian Crusade.

The International Christian Crusade was founded in 1928 by the late Mrs. Maud Howe to combat the false philosophies of atheism, modernism, and communism. Our literature has gone to almost every part of the English speaking world; and our major booklet "Evolution Science Falsely So Called" has been translated into Japanese, Swedish, and Dutch. With the 19th edition 200,000 copies have been printed. A smaller undocumented booklet for high school students is called "Is Evolution a Fact?" The pamphlet "Marx and Darwin" describes the unholy alliance of Marxism and Darwinism. A small tract "The Monkey Trial" tells of this famous trial and its significance today.

Sincerely,
Mrs. G. Holmes
for the
International Christian Crusade
Room 31, 205 Young Street
Toronto, Ontario, Canada

RESEARCH SPONSORED

(Continued from page 105)

leaves) instead of the usual two. It might be supposed that such plants would be at an advantage, in that they have more leaf surface during a crucial stage of their growth. But, in fact, when judged by every criterion, such as survival, resistance to frost, and amount of fruit or seed produced, the mutant plants were inferior.

Clearly these findings are evidence for what Creationists have long maintained: that there are no beneficial mutations, and that consequently it is absurd to look to mutations for improvements to bring about evolution.

For a study of this sort, the more specimens the better. So Dr. Tinkle asks readers to help. Anyone finding a plant with more than the normal number of cotyledons (the simple first leaves, quite distinct from the later leaves) is asked to mark it, and let it mature. Then,

when the seeds are ripe, send some mature seeds to Dr. William J. Tinkle at Timbercrest Home, Box 368, North Manchester, Indiana 46962. Some seeds from normal plants should be sent also, for comparison. Each set of seeds should be sent in separate, marked envelopes.

— The Editor

References

- ¹Williams, E. L., R. J. Herdtklotz, G. L. Mulfinger, R. D. Jonsonbaugh, and D. L. Pierce 1976. Deposition of calcium carbonate in a laboratory situation, *Creation Research Society Quarterly* 12(4):211-212.
²DeYoung, Don B. 1976. The precision of nuclear decay rates, *Creation Research Society Quarterly* 13(1):38-41.
³Wilcox, F. L., and S. T. Davidson 1976. Experiments on precipitation brought about by mixing brines, *Creation Research Society Quarterly* 13(2):87-90.
⁴Tinkle, William J. 1975. Further research on reduced viability of mutant plants, *Creation Research Society Quarterly* 12(1):52.

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 \$10.00 (Foreign, \$11.00 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 \$10.00 (Foreign, 11.00 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: \$13.00 (Foreign, \$14.00 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.

Board of Directors *Biochemistry*: Duane T. Gish, Ph.D., Institute for Creation Research, 2716 Madison Avenue, San Diego, CA 92116. *Biological Sciences*: Wayne Frair, Ph.D., Secretary, The King's College, Briarcliff Manor, NY 10510; George F. Howe, Ph.D., Los Angeles Baptist College, Newhall, CA 91321; Lane P. Lester, Ph.D., 110 Wisteria, Orlando, FL 32806; John R. Meyer, Ph.D., University of Louisville, Louisville, KY 40208; Wilbert H. Rusch, Sr., M.S., LL.D., Membership Secretary, Academic Dean, Concordia College, Ann Arbor, MI 48105. *Genetics*: John W. Klotz, Ph.D., Academic Dean, Concordia Seminary, St. Louis, MO 63105; Walter E. Lammerts, Ph.D., Freedom, CA 95019; William J. Tinkle, Ph.D., Timbercrest Home, North Manchester, IN 46962. *Geology*: Clifford L. Burdick, M.S., D.Sc., 924 N. 6th Avenue, Tucson, AZ 85705. *Geophysics*: Harold Slusher, M.S., D.Sc., University of Texas at El Paso, TX 79902. *Physical Sciences*: Harold Armstrong, M.S., Publications Editor, Queens University, Kingston, Ontario, Canada; Thomas G. Barnes, D.Sc., President, University of Texas at El Paso and Consultant to Globe Universal Sciences, Inc., El Paso, TX 79902; Richard G. Korthals, M.S., Treasurer, Dean, Concordia Teachers College, River Forest, IL 60305; Henry M. Morris, Ph.D., Institute for Creation Research, 2716 Madison Avenue, San Diego, CA 92116; George Mulfinger, M.S., Bob Jones University, Greenville, SC 29614; Emmett L. Williams, Jr., Ph.D., Vice-President, Bob Jones University, Greenville, SC 29614. *Science Education*: John N. Moore, M.S., Ed.D., 136 Brody Hall, Michigan State University, East Lansing, MI 48824.

