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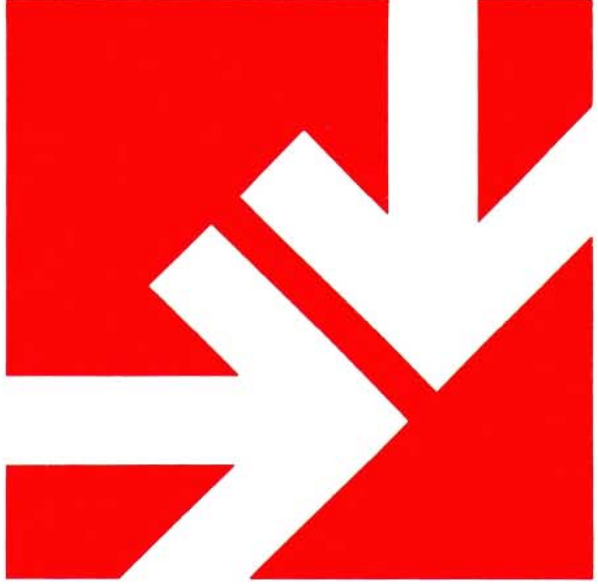

An evangelical perspective on science and the Christian faith

Catastrophism

with special reference to Immanuel Velikovsky

Fact or Fancy?
Science or Fantasy?
History or Mythology?

"The fear of the Lord is the beginning of Wisdom." Psalm 111:10

VOLUME 25 NUMBER 4 DECEMBER 1973

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For the building materials of Science (logic, mathematics, the beginning of a rational interpretation of the world) we have to look to the Greeks; but the vitamins indispensable for a healthy growth came from the biblical concept of creation.

R. Hooykaas
Religion and the Rise of Modern Science. Eerdmans (1972), p. 85

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The Case for Global Catastrophism

LOREN C. STEINHAUER

Department of Mathematics
Massachusetts Institute of Technology
Cambridge, Massachusetts

The Courtroom Ordeal

Few experiences are more gripping than the spectacle of the courtroom. The pomp; the flowing robes of the judge; the pounding gavel; the booming voice of the bailiff; the buzz of the audience all build an aura of pageantry. Simultaneously, the nervous defendant; the flash and oratory of the prosecuting attorney; the compassion of his opponent build an air of intrigue and suspense. Even the very words spoken contribute to the scene: wit and sarcasm; heated diatribe and cool rejoinder; the indignation, the railing; pathos and bathos. And yet in all of these one does not observe the real substance of a trial. The trial substance lies in the witnesses themselves, and in their testimony. Strip away all the pomp and routine and you still have a trial. Strip away the witnesses and there is nothing left.

Many witnesses may be called to testify during the course of a trial. There are the eye-witnesses who have actually observed this or that. There are the written witnesses; the letters, the contracts, which are called to testify. There are the objects brought forth, physical evidences such as the supposed "murder weapon" for example. Indeed, all the available witnesses are called in order to build the most convincing case. Naturally, the composite testimony will seem to contain contradictions; some arising simply from variant vantage points and others possibly arising from false testimony. Each witness is examined and cross-examined to determine the validity of his account.

The courtroom ordeal is not limited to the legal profession but enters into other endeavors, and science is a leading example. In particular, the study of earth history[1] involves a courtroom-like drama to uncover the truth about supposed historical events. Here, the terminology is different; a theory is being built and tested. But the process is essentially the same: witnesses must be examined to build the case, and then they must be cross-examined to test it. In this work, a case is built upon the testimony of several witnesses to describe the overall character of earth history.

The Thesis of Global Catastrophism

The last 2600 years of earth history have been peaceful in that the only physical catastrophes have been strictly local in scale (flooding rivers, violent storms, volcanic eruptions, etc.) and not worldwide in any real sense. In contrast, the period from the creation of earth to about 700 B.C. was marked by peaceful periods interrupted by several violent catastrophes of worldwide impact brought about largely by extraterrestrial causes. These great convulsions were generally expressions of divine wrath upon human wickedness. In the following discussions it will be shown that the witness of available records supports this hypothesis.

It must be recognized that if global catastrophism is on trial, then so is the doctrine of uniformitarianism. In particular, so is the teaching of substantive uniformitarianism which presupposes that earth has had a peaceful history, devoid of any catastrophe of global scope. The present article builds the case for a theory which is in total contradiction with uniformitarian doctrine. Hence if global catastrophism is established (and strong evidence supports it), it stands as a witness of the pitiful inadequacy of uniformitarianism to give a true picture of earth history.

Examining the Witnesses

The case for global catastrophism is built upon the testimony of several witnesses. The three basic categories of witnesses are the divine record (Scripture), human records and physical evidences in the universe. Before calling for the testimony, the general qualifications of the witnesses must be established. And more specifically, we must know how to interpret their testimony so as to draw out a true report.

The first source of information is Scripture which provides two different categories of facts. Uniquely, Scripture gives information on the operation of divine will in the universe. Only in the Bible is found truth regarding the purposes and objectives of the Creator in space-time events. The Bible does not indicate the actual mechanism used by God to bring about an event, but it usually does reveal His purpose. The Bible is also a source of historical data. A comment is needed on the qualifications of the human writers of Scripture. There are those who immediately dismiss the value of the Biblical record as a source of data because of the "nonscientific background" of the human writers. It may rather be argued that the "nonscientific" writer of Scripture recorded exactly what he saw (the eyeball approach) in contrast to a modern scientist who may discard some bit of information if it does not fit into his scheme. The objectivity of the Bible's historical accounts is seen in its recording of many embarrassing events, which (it seems) the human author might have found in his own interest to delete.

Any record (including the Bible) requires proper interpretation. The interpretation of Scripture has been a subject of great controversy, but it seems that the only reasonable method is the literal, or grammatical-historical method. As defined by Bernard Ramm:

> The literal method of interpretation is that method that gives to each word the same basic meaning it would have in normal, ordinary customary usage, whether employed in writing, speaking or thinking.[2]

In another work, Ramm[3] presented a section on the language of the Bible with reference to natural things.

The second source of information is human records, including all written history (excluding the Bible), recorded mythologies, and archaeological artifacts. Ancient writers, like the Biblical writers, used the eyeball approach, writing down what they saw. Thus it is reasonable to use something akin to the grammatical-historical method of interpretation. Regarding the qualifications of the ancient observers, it must be noted that there are many known instances in which they recorded events with great accuracy. Indeed the Chaldean and Egyptian astronomers made very accurate observations and Hipparchus, a Greek, actually discovered the minute precession of the equinoxes in the second century B.C. Recognizing the accuracy of the ancients over against that of a massive extrapolation in modern science, Rene Gallant asked:

> One of the two must be wrong! Which? The ancient people who described what they saw, or the astronomers whose calculations were made 4,500 years later? The testimony of eye-witnesses in Antiquity may not be so lightly disregarded![4]

If global catastrophism is on trial, so is the doctrine of uniformitarianism.

On the question of authority, human literature must be clearly distinguished from divine revelation. The latter is inerrant as given by God, while the former is subject to error. Therefore even greater care must be exercised in interpreting human records, especially the myths which may contain only a grain of truth in the midst of a volume of untrue trappings. Myths are the victims of substantial transmission errors, the transmitting person throwing in interpretations or even embellishing the story. Frequently, in myths particularly, false ideas on the *cause* of an event have crept in. Therefore in interpreting a myth, one must be careful to distinguish actual observation from suggested cause (which is sometimes a problem in modern scientific observation as well). A good check system on mythologies is correlation. If several distant cultures have myths describing the same event (with some variations allowed), then one may conclude that such an event is indeed historical.

The third source of information is physical evidences in the universe. This is an important source but in many ways is the weaker of the three, since it gives only the present remains of what has happened in the past. The physical evidence at a point on the earth at the present instant is the sum total of all the events that have happened down through history at that local point, and summations tend to sweep many details into the oblivion of the total. Nevertheless physical evidences may often be the only record available. Furthermore, even when eyewitness accounts are known, physical evidences become invaluable as correlations for testing whatever theory one may develop regarding a historical event.

Testimony of the Witnesses

A. *The Scripture: divine wrath amid divine faithfulness.* God has a stake in the regularity of natural law and the orderly function of nature, since these things stand as everpresent testimonies of His faithfulness. But as God has revealed Himself through the regularity and order of nature, He has also demon-

strated His ability to suspend its general course. Such interjections usually took place entirely in the sphere of natural law. Indeed a miracle is not necessary to perpetrate a catastrophe: even a global one. This is particularly clear when extraterrestrial materials are involved. One must not think though that God has never resorted to miracles (suspensions of natural law). In fact numerous examples are recorded in Scripture, particularly in the earthly ministry of Jesus Christ. Violent natural catastrophes were not the pointless play of a fickle deity but rather the intentional expression of God's righteous wrath upon wickedness:

> Fire goes before Him, and burns up His adversaries round about. His lightnings lit up the world; the earth saw and trembled. The mountains melted like wax at the presence of the LORD, At the presence of the LORD of the whole earth. The heavens declare His righteousness, and all peoples have seen His glory. (Psalm 97:3-6)[5]

The same theme is sung in Job 9:6, Psalm 18:7, and Jeremiah 10:10.

A categorical listing of catastrophes recorded in Scripture include the following.

(1) *The Flood* (Genesis 6-8) was the expression of God's judgment on the wickedness of man in Noah's day (II Peter 2:5, Genesis 6:5-7). The Genesis account suggests the Flood was global in scope: "all the high mountains were covered . . . and all flesh perished, and all mankind" (Genesis 7:19, 21).

(2) *Sodom and Gomorrah* (Genesis 18, 19) were two ancient cities destroyed by a judgment from God (Genesis 18:20, II Peter 2:6, Jude 7). Their demise was awesome:

> The LORD rained on Sodom and Gomorrah brimstone and fire from the LORD out of heaven, . . . the smoke of the land ascended like the smoke of a furnace. (Genesis 19:24, 28) He condemned the cities of Sodom and Gomorrah to destruction by reducing them to ashes. (II Peter 2:6)

Their destruction was from space, involving the fall of burning firey stones.

Scripture clearly testifies of several catastrophes in history, some of which are global in scope and extraterrestrial in cause.

(3) *The Exodus* (Exodus 8-19) of Israel from Egypt saw numerous great catastrophes, including the plagues (judgment on the Egyptians), the parting of the Red Sea and its return (also judgment) and the upheaval at Sinai. Some of the disturbances were from space: "thunder, hail, and fire . . . rained on the land of Egypt" (Exodus 9:23). The upheaval at Sinai was not judgment but a visible revelation of the awesome power of God:

> Now Mount Sinai was all in smoke because the LORD descended upon it in fire and its smoke ascended like the smoke of a furnace, and the whole mountain quaked violently. (Exodus 19:18)

(4) *The fall of Jericho* (Joshua 6) was a divine judgment on "disobedience" (Hebrews 11:31), which was perpetrated as "the walls fell down flat" (Joshua 6:20).

(5) *Joshua's long day* (Joshua 10) saw the execution of divine judgment on the armies of Canaan, through the armies of Israel. In the process, God caused a disturbance in the motion or apparent motion of the sun so that the battle could be carried to a decisive conclusion.[6] The altering of the sun's motion suggests an extraterrestrial cause, as does the associated phenomenon:

> The LORD threw large stones from heaven on them; . . . there were more who died from the hailstones than those whom the sons of Israel killed with the sword. (Joshua 10:11)

(6) *The dial of Ahaz incident* (Isaiah 38) in which the sun's apparent motion was disturbed, was not a judgment but the indication that God had heard the prayer of Hezekiah for an extended life. Again an extraterrestrial source of the disturbance seems to be the simplest explanation.[6]

(7) *General reference to catastrophes* are numerous in Scripture. Among them are the following: earth shaking (Psalm 18:7, 60:2, 97:4, 104:32, 114:7, Hebrews 12:26), the last reference clearly suggesting a shaking of the whole earth (global catastrophe); mountains shaken and moved (Job 9:5, Psalm 18:7, 114:4); mountains melting (Psalm 97:5); heavens moved (II Samuel 22:8, Job 26:11), suggesting a disturbance in or from space; earth moved out of place (Psalm 82:5), indicating a global disturbance from space; change in times and seasons (Daniel 2:21, 22), also indicating a global disturbance from space. Thus, we may conclude that Scripture clearly testifies of several catastrophes in history, some of which are global in scope and extraterrestrial in cause. Scripture also teaches that behind the catastrophes was the purposeful expression of divine judgment on wickedness, or in at least one case, the revelation of God's awesome power to His people Israel.

It should also be noted that many prophetic passages foresaw global upheavals involving extraterrestrial phenomena, which are the judgments of God. Since this work deals with historical events these passages will not be listed, save one of particular significance. The apostle Peter warns of those who might mock the idea of God judging by catastrophe:

> Know this first of all, that in the last days mockers will come with their mocking . . . and saying, 'Where is the promise of His coming? For ever since the fathers fell asleep, all continues just as it was from the beginning of creation.' For they are willfully ignorant of the fact that by the word of God the heavens existed long ago and the earth was formed out of water and by water, through which the world at that time was destroyed, being flooded with water. (II Peter 3:3-6)

B. Human records: danger in the skies. Human records describing the era since about 700 B.C. picture a rather peaceful environment for man. Not so for more ancient times where there is ample testimony of several great cataclysms of global scope, extraterrestrial origin and severe intensity. A great deal of modern research has dealt with these ancient records, and the following discussion can be only a categorical summary of data that has been accumulated.

(1) *Traditions of periodic catastrophes* were common among the ancients. Most of the ancient philosophers believed that the earth experienced periodic

worldwide disasters which dramatically altered its face, nearly annihilating life. Immanuel Velikovsky listed several ancient philosophers and philosophies that "believed in periodic conflagrations by which the world was consumed and shaped anew."[7] He also listed ancient cultures from every corner of the globe who believed in "world ages" separated by catastrophes. Most if not all of these traditions are classified as mythology. But while they contain many imaginative appendages, there remains much truth to be drawn out. This becomes apparent when one hears the chorus of voices from widely separated (and seemingly unrelated) civilizations calling together for peaceful world ages punctuated by worldwide destructions. The voices of mythologies are supported by another branch of human records, archaeological stratigraphy, which according to C. F. A. Schaeffer points conclusively toward a series of contemporaneous downfalls of civilizations throughout Eurasia.[8] Schaeffer concluded that these could only be the result of great catastrophes.

(2) *The strange world of the ancients* differed in several ways from our own. This fact does not necessarily imply catastrophes. But a simple extrapolation of present rates and conditions back to ancient times does not account for the differences—suggesting an abrupt alteration from outside forces. Two examples are cited. First of all, there is striking evidence that the pole star seen by the Egyptians in the 25th century B.C. was not Polaris but a star in the Great Bear constellation (popularly called the Big Dipper).[9] This is in major contradiction with the extrapolation of earth's current axial precession rate which calculates the pole star of the ancients to be very much nearer to Polaris. A second example is archaeological evidence that the downfall of civilizations (mentioned above) were concurrent with abrupt "climatic changes which seem to have brought about transformations in the occupation and the economy of the country."[10] Slow climatic changes are known to occur (and still are) but a widespread abrupt change suggests an unusual cause, probably extraterrestrial.

(3) *Flood traditions* were a part of the folklores of many cultures. This is perhaps the most striking thing to be observed in surveying these ancient traditions. A geographer of the last century named Andree claimed to have compiled flood traditions of 88 different cultures and societies, equally distributed between the eastern and western hemispheres. Many details differ between these myths but a very strong common theme emerges: several people are saved on a boat from a worldwide flood. A summary of flood traditions is given in a book by Alfred Rehwinkel.[11]

(4) *The ancients were preoccupied with the astral.* In the ancient world, following the stars and other celestial bodies was not simply a recreational activity. Rather it seemed to permeate every part of life. Architectural structures were designed to trace by shadow the path of the sun. The obelisk, ziggurat, sundial and similar structures found in both hemispheres were designed for this purpose.[12] Furthermore, the ancient religions generally involved the worship of heavenly bodies. The Roman historian Josephus described the patriarch Abraham as being *alone* in his belief that one should worship the Creator rather than the heavenly bodies themselves.[13] The ancients were preoccupied with the astral for a reason; there had been great irregularities in the heavens which were accompanied by upheavals on earth.[14] Hence they tracked celestial bodies with great concern and apprehension in anticipation of further disturbances.

(5) *Calendaric changes* were necessary in ancient times. The Egyptians are known to have introduced more than one change in the length of their year.[15] Velikovsky has assembled evidence that other peoples of the ancient world made similar changes.[16] Only a massive extraterrestrial force could produce such a change in an abrupt fashion.

The ancients report a number of great catastrophes with severe effects on man and his environment.

(6) *Details of specific catastrophes* pictured in ancient literature and mythology are utterly frightening. Darkness, earthquakes, falling fire, falling stones, massive simultaneous vulcanism, noise and tumult, lightning and strong winds are described.[17] All of these may occur on a local scale with limited intensity today. But the frightening accounts of the ancients go far beyond the local and ordinary. Some of these upheavals are likely of extraterrestrial origin (falling stones, fire) and others strongly suggest extraterrestrial forces as the cause (massive vulcanism, widespread earthquakes).

There are other ancient reports of cataclysms in the heavens not directly affecting earth. For example the mysterious disappearance of the planet Electra.[18] But the pattern has been established: the ancients report a number of great catastrophes with severe effects on man and his environment.

C. Physical records: disturbance and discontinuity. A careful observer of earth's great physical wonders is certain to be impressed by the scale and beauty of such spectacles. Many of these great wonders testify of birth by trauma and many exhibit the scars of harrowing destruction. Indeed evidence comes from every quarter that earth's crust has had a history marked by trauma and cataclysm. Geologists have assembled a great volume of facts supporting global catastrophism. This is in spite of the domination of their science by the uniformitarian axiom of a peaceful earth history. It is feasible to summarize only some of these results in this work.[19]

(1) *Sediments* compose the majority of earth's exposed crust. Sedimentary rock is laid in strata by waters bearing soil or minerals. According to uniformitarian assumption, it was believed that these layers were deposited for ages at the same minute rate as can be measured today. In an article on stratigraphy (the study of sediments), Stuart E. Nevins cited several reasons why the sedimentary record could not have been laid in the leisurely manner that sediments are presently being formed.[20] First of all, he notes that several types of sedimentary rock are only formed under conditions of violently rushing or turbulent water. Furthermore, there are some kinds of sediment that are *not* being formed today in contradiction to an axiom of uniformitarianism. Many coal deposits could not have been formed by peaceful sedimentation in a

swamp (a popular uniformitarian theory) but reflect violent formation seen in the topsy-turvy orientation of trees and other fossils therein. Finally, it must be noted that these sedimentary layers seem to follow global patterns. This is not yet a firm conclusion but preliminary work seems to support it. If it is true, then one may conclude that the sedimentation was global, as well as catastrophic.

(2) *Mass extinction of life forms* is apparent in the sediments. If one peers closely into the strata he will find that the solid rock is actually a tomb for countless myriads of fossils—animal and plant; large and small. The basic requirement for the preservation of a fossil is that the creature be buried rapidly, in a time short compared to the decay time of a carcass.[21] This is not the kind of burial that a creature would receive at the current sedimentation rate where it may take hundreds of years to bury a medium sized shellfish. In addition to its rapidity, the burial of fossils seems to have been worldwide in extent and simultaneous in timing. This realization led a paleontologist to write: "the worldwide incidence of extinction . . . leads one to look for an extraterrestrial cosmic cause."[22] Similar extinctions have occurred due to the massive onset of ice, burying flora and fauna of diverse types in the higher latitudes.[23] In many places the ice remains until today, and many of these specimens can be found perfectly preserved in the polar deep freeze. The manner of extinction seems to have been violent as well as rapid. In both cases (fossilized and frozen) many of the creatures were torn and broken as they died. Finally it may be added that these extinctions involved incredible numbers of animals. The creatures were packed together and buried in numbers that boggle the imagination. In other places where fossilization or freezing did not occur, one can find bone graveyards in which literally millions of bones of diverse animals are all mixed together. Indeed mass extinction is one of the strongest physical evidences for global catastrophism.

(3) *Meteoric bombardment* has left a number of craters on earth. Some were thought to have been volcanic in origin but more scrutiny has shown many to be meteor craters. In his book, Gallant lists a number of known meteor craters and others that are possibly such.[24] Some of these are many miles in diameter. Such an impact would certainly generate a major local disturbance, if not a global upheaval due to the tidal waves or earthquakes generated.

It is a firm conclusion from physical evidences that earth has experienced violent catastrophes in the past.

(4) *Massive glaciation* has left clear marks in large areas in both northern and southern hemispheres. There has long been the theory of repeated ice ages but it has been suggested that physical evidence supports a single great ice epoch.[25] It was rapid in onset, as testified by the sudden burial and freezing of many life forms. An extraterrestrial cause seems to be the only one that could produce such a sudden onset of a glacial epoch.[26]

(5) *The unusual world of the past* is reflected in the physical record. The outstandiing difference between our world and that of the ancients may be the great differences in climate: moistness in today's deserts, temperate and even subtropical vegetation in today's polar regions.[27] Furthermore, there is paleomagnetic evidence that earth's magnetic field has experienced reversals (at least locally) in polarity.[28] Of course vastly different conditions in the past do not necessarily imply rapid change, but these are seemingly unaccountable by an extrapolation of present conditions.

(6) *Extraterrestrial catastrophes* have left their mark on the solar system. Among them are the rings of Saturn and the Asteroids, which appear to be the irregular fragments of a body pulled apart by gravitational forces.[29] Also, there are huge craters on the moon and Mars (many if not most of which are meteoric in origin). This shows that there have been *major* collisions of meteors with bodies near the earth, which renders plausible the suggestion that earth has experienced the same.

Conclusions

It is then a firm conclusion from physical evidences that earth has experienced violent catastrophies in the past, some of which were global in scope and/or extraterrestrial in cause. Moreover, as one studies the testimony of all three witnesses, obvious correlations appear. Instead if the witnesses are true, the testimonies should corroborate, and indeed they do. The overall conclusion is that while there were long peaceful periods in ancient times allowing great civilizations to develop, there were also a few violent global catastrophes which left indelible marks on the face of earth and in human and divine records.

FOOTNOTES

[1]By "earth history" is meant the history of all physical events of planet earth since it origin. It is to be distinguished from human history excepting where man affects earth history, or records the events thereof.

[2]Bernard Ramm, *Protestant Biblical Interpretation* (W. A. Wilde; Boston, 1950), p. 53.

[3]Ramm, *The Christian View of Science and the Scripture* (Eerdmans; Grand Rapids, 1966), pp. 65-80.

[4]Rene Gallant, *Bombarded Earth* (John Baker; London, 1964), p. 148.

[5]Scripture quotations throughout this article are from the New American Standard Bible.

[6]There has been much controversy on whether the long day of Joshua and the dial of Ahaz incident were actually interruptions in the motion of the earth. This author believes that the question has not been settled, except that some sort of major disturbance occurred, the details of which are uncertain at this time.

[7]Immanuel Velikovsky, *Worlds in Collision* (Delta; New York, 1950), pp. 29-35. A comment is in order on the works of Velikovsky. He has been a controversial figure due to the material presented in his books. This is largely because he is a catastrophist which goes against the grain of the popular uniformitarian assumptions. It is also partly because most of his theories seem fanciful with no reasonable physical explanation. But Velikovsky's inability to construct meaningful physical theories should not be a reflection on his ability to assemble great masses of ancient records pointing toward catastrophes in the past—which he has done. It is a mistake to discard these compilations simply because he missed the mark on physical theories.

[8]C.F.A. Schaeffer, as quoted in Gallant, *op. cit.*, pp. 214, 215.

[9]Gallant, *op cit.*, pp. 146-148; Velikovsky, *op. cit.*, pp. 313, 314.

[10]C.F.A. Schaeffer, as quoted in Gallant, *op. cit.*, pp. 214, 215.

[11]Alfred M. Rehwinkel, *The Flood* (Concordia; St. Louis, 1951), pp. 127-176.

[12]Velikovsky, *op. cit.*, pp. 317-323.
[13]William Whiston, *Flavius Josephus; The Antiquities of the Jews* (M. Sherman; Bridgeport, Connecticut, 1828), pp. 94, 95.
[14]*Ibid.*, pp. 94, 95.
[15]Gallant, *op. cit.*, pp. 212, 213.
[16]Velikovsky, *op. cit.*, part II, chapter 8.
[17]*Ibid.*, pp. 53-65 91-93.
[18]Donald W. Patton, *The Biblical Flood and the Ice Epoch* (Pacific Meridian; Seattle, 1966), pp. 45, 46.
[19]Most geologists are of uniformitarian persuasion, and many have made a strenuous effort to force a uniformitarian interpretation on the facts of the physical record. Often this has led to wresting the facts, forcing them into an entirely unnatural interpretation. It is the intention of the author to interpret the facts in this section in the natural and simplest way.
[20]Stuart E. Nevins, "Stratigraphic Evidence of the Flood", in *Symposium on Creation III* (Baker; Grand Rapids, 1971), pp. 32-65. Under certain flooding conditions, sediments may be laid at a significantly larger rate than the average rate from the global viewpoint. But the picture presented in the sedimentary record seems to indicate widespread—even global—sedimentation that took place more or less simultaneously. This is a violation of substantive uniformitarianism which permits only local deviations from the global mean rate of sedimentation (which is taken as constant in time).
[21]Clifford L. Burdick. "The Structure and Fabric of Geology", *Creation Research Society Quarterly*, Vol. 7, pp. 144, 145 (1970).
[22]H. Linger, as quoted in Gallant, *op. cit.*, p. 115.
[23]A pair of interesting articles have appeared in the popular press on the frozen mammoths that have been found: Ivan T. Sanderson, "Riddle of the Quick-Frozen Giants", *Saturday Evening Post*, Jan. 16, 1960, p. 39ff, and Charles H. Hapgood, "The Mystery of the Frozen Mammoths", *Coronet*, Sept., 1960, p. 71ff.
[24]Gallant, *op. cit.*, part II, chapters 1 and 2.
[25]William A. Springstead, "Monoglaciology and the Global Flood", *Creation Research Society Quarterly*, Vol. 8 pp. 175-182 (1971). Uniformitarians have seemingly been able to accommodate the concept of ice ages by assuming they appeared slowly—in periods spanning many thousands of years. The evidence assembled by Springstead as well as that on the frozen mammoths (footnote 24) indicates that the ice age(s) had a rapid onset.
[26]Patten, *op. cit.*, chapter VI.
[27]Dolph E. Hooker, *Those Astounding Ice Ages* (Exposition Press; New York, 1958).
[28]Allan Cox, G. Brent Dalrymple, and Richard R. Doell, "Reversals in Earth's Magnetic Field," *Scientific American*, Vol. 216, pp. 44-54, Feb., 1967.
[29]Neither the catastrophic origin of the Asteroids nor the meteoric origin of lunar and martian craters has been firmly established. But certain facts seem to support these conclusions: for example, the Asteroids are irregular seemingly broken fragments, suggesting a catastrophic origin; and the great similarity between lunar craters and terrestrial meteor craters, suggests that lunar craters were formed by meteoric impact.

Immanuel Velikovsky's Catastrophic History

EDWIN M. YAMAUCHI

History Department
Miami University
Oxford, Ohio

Immanuel Velikovsky

Immanuel Velikovsky is a gifted and imaginative writer who has proposed a daring reconstruction of ancient history on the basis of world-wide catastrophes caused by extra-terrestrial forces. He first gained notoriety with his best-seller, *Worlds in Collision*, published in 1950 by Macmillan despite the pressures of influential scholars who sought to suppress the work.[1] His subsequent works include: *Ages in Chaos I: From the Exodus to King Akhnaton* published in 1952, *Earth in Upheaval* published in 1955, and *Oedipus and Akhnaton* published in 1960—all issued by Doubleday.[2]

The reaction of the scientific and scholarly world, with a few exceptions, was quite hostile to Velikovsky's proposals, although popular reviews tended to be favorable. After a decade of being virtually ostracized by the academic community, Velikovsky has become a popular lecturer before college audiences. By the demonstration of his wide interest in many disciplines and his intense sincerity, he has gained a loyal following. Interest in Velikovsky's ideas has been generated by a new magazine, *Pensée*, published by the Student Academic Freedom Forum.[3] Several universities and colleges offer courses with lectures on Velikovsky's ideas.[4] Disciples of Velikovsky are being urged to stand up and be counted.[5]

Velikovsky's Theory

An examination of ancient records led Velikovsky to declare that two series of world-wide catastrophes occurred, the first in the 15th cent. B.C. and the second in the 8th and 7th cent. B.C.[6] Velikovsky believes that Venus emerged from Jupiter as a proto-planet some 3500 years ago and caused cataclysms as it approached close to the earth in the form of an enormous comet in the 15th cent. B.C. In the second period Venus pulled

Mars off its orbit, and Mars in turn affected the earth in a catastrophic manner. Some two decades after his initial proposals, Velikovsky remains convinced of his theory in all but minor details.[7]

His supporters have claimed for Velikovsky a series of successful predictions, particularly with respect to properties of the planets and of the moon, which have been confirmed by the space program.[8] On the other hand, the list of the confirmations of his historical reconstruction includes but three quite general predictions: 1) The support of Claude Schaeffer's compendium of archaeological results, published in 1948. 2) The prediction that Linear B would prove to be Greek when deciphered. 3) The prediction that Mesoamerican culture would prove to be several centuries older than believed.

Schaeffer's compendium incorporates the results of excavations conducted before World War II and is quite outdated. His very general remarks about natural catastrophes apply to the period c. 1700 B.C. and not 1500 B.C. as Velikovsky's revised chronology requires. There was incidentally a much greater disruption of cultures in the Mediterranean and Near East c. 1200 B.C. which Velikovsky has thus far ignored in his published writings.

Velikovsky's predictions that Linear B would turn out to be Greek was made about a month before an official announcement of the decipherment in November, 1953. Though many scholars doubted that this would be the case, the prediction did not require much prescience. Michael Ventris and John Chadwick had distributed position papers suggesting such a solution months before the official announcement.

Whether the predictions of extra-terrestrial phenomena made by Velikovsky are remarkable or not I shall leave to astronomers and other scientists to judge. In any case, they can hardly be used as a confirmation of his radical historical reconstruction as claimed by S. Talbott, the editor of *Pensée:* "But in *Worlds in Collision* Velikovsky's claims are based almost exclusively upon an examination of historical records. Space age discoveries emerge as *confirmations*, not the original basis for his views."[9]

Egyptian Dates

The framework of ancient history, especially for the 3rd and 2nd millennia B.C., is based largely on carefully recorded Egyptian dates which can be anchored by astronomical fixes. Velikovsky rejects this chronology and erects his own unorthodox chronology. To support this reconstruction he appeals to radiocarbon dates which are often several hundred years younger than the expected dates from Egyptian documents.[10] This discrepancy applies, however, primarily to dates prior to 2000 B.C.[11] and can be corrected by data obtained by H. Suess in his study of bristlecone pine trees as explained by W. F. Libby.[12]

That the Egyptians used a solar civil calendar of 360 days plus 5 epagomenal days is no basis for Velikovsky's claim that we have evidence to prove that the year was once only 360 days long before the earth's axis was shifted by the approach of Venus.[13] The Egyptians also used a luni-stellar calendar of 354 days with an intercalary month every 3 years, and a sidereal calendar of 365¼ days based on the heliacal rising of the star Sothis (Sirius).[14]

Sources for the 15th-century B.C. Catastrophe

Velikovsky combines sources from a variety of areas to argue for a world-wide catastrophe in the 15th century B.C. He writes:

> Troy III was destroyed and covered by a fifty-foot layer of ashes when the Middle Kingdom in Egypt fell; the volcano on the island of Thera exploded with almost unimaginable fury; recent archaeological work in the Indus Valley showed, too, that about -1500, and in advance of the Arian invasion, cities with great walls were destroyed and a flourishing civilization came to a sudden end.[15]

This is a farrago of separate events which cannot be combined into one cataclysm. Troy III was covered by 6 feet of debris and "came to its end in some unknown manner, not by fire" in 2200 B.C. according to the excavator, Carl Blegen.[16] The Indus River Valley civilization did come to an end about 1500 B.C. probably at the hands of Aryan invaders.[17] Natural causes, such as a shift in the course of the Indus River, may have played a role in weakening the civilization gradually, but not suddenly.[18]

Elsewhere Velikovsky cites the famous eleventh tablet of the Babylonian Gilgamesh Epic as referring to his world-wide catastrophe. A casual perusal would reveal that the passage cited refers to a storm and a deluge,[19] and not to Velikovsky's concept that "the land was shriveled by the heat of the flames" (of the Venus comet's tail).[20] In any case the most probable date of the deluge described would be at the latest 2700 B.C., the date for Gilgamesh, if not much earlier.[21]

Velikovsky is in error when he writes: "The island (of Crete) was not invaded until the arrival of the Dorians, so that the effects of a natural disaster cannot be mistaken for destruction by the hand of man."[22] Crete was invaded c. 1450 B.C. by the Mycenaean Greeks, who occupied Knossos until c. 1400 B.C.[23] It is probably true, however, that the simultaneous destruction of a number of Late Minoan sites was the result of natural causes rather than human agencies. It is a curious lapse that Velikovsky does not directly connect the disasters which befell Crete and Thera in a causal relationship. In all probability the fallout from the eruption of Thera in the 15th century and the accompanying earthquakes were probably responsible for the destruction of Minoan sites on central and eastern Crete.[24] The explosion and disappearance of part of Thera-Santorini has been considered by some as the basis of the Atlantis legend.[25] Needless to say, a volcanic eruption even on such a cataclysmic scale as that of Thera or more recently of Krakatoa does not require an extra-terrestrial causation.

Our author attempts to connect events of the Exodus and the Conquest with his 15th-century catastrophe. He fancifully suggests that the *barad* of Exodus 9:18 is not hail but meteorites, as Midrashic and Talmudic sources state that the stones which fell on Egypt were hot. There can be no serious reliance placed on late "Legends of the Jews" cited in the Midrash or Talmud. In his earliest work Velikovsky had cited the overturning of the great walls of Jericho, excavated by Sellin and Watzinger, and dated by Garstang to the beginning of the Late Bronze period.[26] Subsequent excavations by Kathleen Kenyon at Jericho from 1952 to 1956 have shown that Garstang's walls

date from the Early Bronze Age, a thousand years before Joshua's time. [27] In any case, most scholars today would date the Exodus and the Conquest not to the 15th century B.C. but to the 13th century B.C.[28]

One of the major documents upon which Velikovsky relied for his original theory was the Papyrus Ipuwer, which describes topsy turvy conditions in Egypt. Usually ascribed to the First Intermediate Period (22nd century B.C.), Velikovsky used it to support his 15th-century catastrophe. Recently J. Van Seters has argued for a dating in the Second Intermediate Period,[29] and a supporter of Velikovsky has claimed that this represents a confirmation of Velikovsky's dating.[30] Van Seters, however, would date the Admonitions to the late XIIIth Dynasty as a description of the disruption induced by the Hyksos in the early 17th century B.C.—not as a description of natural catastrophes in the 15th century B.C. The Admonitions clearly refer to the social disruptions brought on by political anarchy. Isolated statements to the "earth turned upside down" are surely to be taken as metaphorical and not as literal descriptions.

A Revised Chronology of the Hyksos and the Exodus

According to Egyptologists, the Hyksos were Semitic invaders who occupied Lower (northern) Egypt from 1700 to 1570 B.C. Joseph may have been in Egypt during this period. The Exodus is to be dated either to the 15th or to the 13th century B.C.

According to Velikovsky, the Hyksos were Amalekites who migrated from Arabia.[31]

> . . . Israel did not leave Egypt during the New Kingdom, as all scholars maintain, but at the close of the Middle Kingdom.[32a]
>
> . . . the Exodus of the Israelites preceded by a few days or weeks the invasion of the Hyksos.[32b]
>
> The Hyksos were expelled by Saul; their later destruction was the work of Joab, soldier of David.[33]

Neither Velikovsky's identification of the Hyksos with the Amalekites, descendants of Esau who lived in the Negeb, nor his radical reduction of Egyptian dates has the slightest support save in the author's fertile imagination.[34] Nor does his identification of the Hyksos capital of Avaris with el-Arish on the coast of southern Palestine, instead of San al-Hagar or Qantir in the Delta have any merit.[35]

Oedipus, Ahknaton, and the Amarna Age

According to Velikovsky's ingenious reconstruction, alleged incestual relations of Akhnaton with his mother Tiy provided the historical prototype of the Greek legend of Oedipus.[36] He argues:

> In the legend Oedipus' feet are swollen; in the pictures of Akhnaton the thighs are swollen. In folklore feet may stand for legs. Many languages do not have different words for legs and feet . . . . thus the name Oedipus could, and even preferably so, mean "swollen legs."[37]

He speculates that like Oedipus, Akhnaton was not in Thebes during the years that preceded his father's death, and makes the gratuitous assumption that Akhnaton spent his childhood abroad.[38] He interprets a bas relief in which Akhnaton holds Tiy's hands as evidence for incestual relations: "They advance toward the inner portal of the temple as lovers, not as a son and a mother."[39] As a further proof of the parallels with the Oedipus cycle, Velikovsky assumes that Smenkhkare and Tutankhamen, Akhnaton's immediate successors, were as prototypes of Polynices and Eteocles not only brothers but were also the sons of Akhnaton.[40]

Inasmuch as the right to the throne in Egypt was determined by matrilineal descent from the Great Wife of a pharaoh, the consanguineous royal marriages were a matter of political expediency. Ramesses II married not only his mother and his sisters but also his own daughters.[41] In Akhnaton's case we have evidence that he married two of his own daughters but no evidence that he committed incest with his mother. He had no sons. Smenkhkare and Tutankhamen were no doubt brothers but were not his sons; they were most probably also brothers of Akhnaton.[42]

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Velikovsky admits that if a co-regency between Amenhotep III and his son Amenhotep IV=Akhnaton can be proved, "then the correspondence with the Oedipus story is completely shattered."[43] Cyril Aldred has recently examined the various arguments for and against such a coregency, and has concluded:

> The Athribis block in fact gives such unequivocal testimony that the two kings were ruling together, the younger taking precedence of the elder at some time before Year 6 of Amenophis IV (when he changed his name to Akhenaten), that opponents of the co-regency theory have been obliged to accept grudgingly the possibility of a co-regency between the two kings which however they reduce to a few months only.[44]

Even a co-regency of a few months would destroy the parallels so carefully drawn up by Velikovsky inasmuch as the Greek legend has Oedipus killing his father Laius, the king of Thebes, without knowing who he was.

Velikovsky's revised chronology places the Amarna period of Akhnaton not in the 14th century B.C. but half a millennium later in the 9th century B.C.![45] This revision is based on the author's identification of the Sumur of the Amarna tablets with Samaria and Gubla with Jezreel.[46] He would also identify the "Biridia" (i.e. Biridiya) of Megiddo in the Amarna texts with the "Biridri" (Akkadian *IM-id-ri* or *adad-id-ri;* biblical Hadadezer) of the 9th-century B.C. texts of Shalmaneser III—an impossible equation from a simple linguistic basis. Objecting to the usual identification of the "Biridri" of Damascus with the biblical Ben-Hadad, Velikovsky ask: "Why did Ahab come to the help of Ben-Hadad, his enemy, at Karkar?"[47]

The author's identifications are so far wide of the mark that one is embarrassed even to discuss them. As Aharoni points out:

> In Papyrus Anastasi I from the beginning of Ramses II's reign Sumur is mentioned as the northernmost city on

> the Phoenician coast in which an Egyptian garrison was stationed. Sumur was a well-known town on the coast of Phoenicia, situated north of Byblos near the mouth of the Eleutheros River . . . .[48]

Gubla is the well-known Phoenician seaport of Byblos: *Gubla* in Akkadian, *Gebal* in Hebrew, and *KPN* in Egyptian. Only the most contorted reading of the Amarna letters could produce any resemblances to events of the 9th century in Israel.[49] The letters, for example, are filled with references to the marauding *Hapiru,*[50] who are completely absent from the biblical narratives of the 9th century.[51] Nor do the texts of Shalmaneser III on the battle of Qarqar have anything to do with the Amarna tablets as Velikovsky would have us believe.[52] As to his objection that an alliance between such rivals as Ahab of Israel and Ben-Hadad of Damascus against the Assyrians was unlikely, we have but to turn to Isaiah 7 where we see at a slightly later period the anti-Assyrian alliance of Pekah of Israel and Rezin of Damascus.[53]

Solomon, the Queen of Sheba, and Shishak

A further consequence of Velikovsky's telescoping of Egyptian chronology is to make Hatshepsut, traditionally dated in the 15th century, a contemporary of Solomon (10th century).[54] The author also goes on to identify Hatshepsut with the biblical Queen of Sheba by comparing Solomon's almug (algum) trees with the myrrh and frankincense trees of Hatshepsut's relief at Deir el-Bahri.[55] The almug trees, however, which were either sandalwood trees or possibly coniferous trees from Lebanon,[56] have nothing to do with the myrrh and frankincense trees which grow only in east Africa and southwestern Arabia.[57]

Instead of accepting the well-attested identification of the biblical Shishak, the pharaoh who invaded Palestine in Rehoboam's 5th year (I Kings 14:25-26; II Chronicles 12:2-10) with the Libyan Shoshenk, Velikovsy proposes a far-fetched identification of the biblical Shishak with Tuthmosis I, ordinarily dated to 1525-1510 B.C.[58] Citing Breasted's publication of Shoshenk's Karnak relief, which is partially damaged, Velikovsky objects to the lack of any reference to spoils from Jerusalem.[59] In a forthcoming study he will identify Sosenk (sic) with King So (II Kings 17:4). His recent remark that "Sosenk only reported tribute from Israel (not Judea) and no campaign"[60] betrays complete ignorance of recent studies on the great Karnak inscription of Shoshenk.[61]

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The Aegean Dark Age

The reduction of 500+ years in Egyptian chronology also eliminates for Velikovsky the Aegean Dark Age: "No 'Dark Age' of six centuries' duration intervened in Greece between the Mycenaean age and the Ionian age of the seventh century."[62] One of the arguments used by Velikovsky to support this thesis involves his belief that the Mycenaean period belonged to the Iron Age:

> One of the main arguments in support of the theory that the Mycennaean (*sic*) Age antedated that of the Homeric epics is based on the assumption that the Mycenaean tombs belong to the Bronze Age while the *Iliad* and *Odyssey* reflect an Iron Age. The weapons of the Homeric heroes are of bronze, but iron is mentioned forty-four times in the epics, and although, from some references, it had been concluded that iron was rare in those times, the Iron Age had already superseded the Bronze Age and steel manufacture was already known.[63]

It should be noted that Homer's treatment of metals in general corresponds with the state of metallurgy in the Late Bronze Age of his heroes rather than in his own Early Iron Age. The former epoch was characterized by a wealth of goldwork, bronze weapons, and decoration with niello which was not true of the later period.[64] Homer mentions only bronze swords and spearheads but no iron examples. Actual remains from the 11th to the 8th centuries B.C. include four bronze swords but over fifty iron swords, thirteen bronze spearheads but over fifty iron spearheads.[65] It is true that among the forty-eight times iron is mentioned in the epics, some iron weapons such as axes and maces are included. In many cases, such as at Iliad VI. 48 and Odyssey XIV. 324, iron is treated as a precious metal which was not yet common. All of this proves that Homer retained some accurate memories of the Mycenaean period and included some references from his own age.[66] But it cannot prove, as Velikovsky wishes, that the Mycenaean Age was an Iron Age.

Another argument which is used to get rid of the Dark Age concerns the state of literacy in the Aegean. Velikovsky comments:

> The decipherment of the Minoan script forced the conclusion that a syllabic alphabet was used in Greece six hundred years before Homer. But amazement still persists, for no literary documents have come down to us from between -1300 and -700. A literate people cannot forfeit completely a well-developed literacy.[67]

This betrays a serious misunderstanding of the state of literacy in the Mycenaean world. The Linear B script was used by the scribes to record mundane lists of produce, etc. We have no connected literary texts, though we have some religious texts.[68] The disappearance of literacy may be more apparent than real. Evidence from Crete indicates that both ink and perishable writing materials were used.[69] Literacy never disappeared from Cyprus.[70] In any case half a millennium of evidence from the Kerameikos graves in Athens and from settlements in Ionia can hardly be excised by the stroke of Velikovsky's pen.[71]

To support his position that Mycenaean structures come not from the Late Bronze Age (15th-12th century B.C.) but from the Iron Age (8th-7th century B.C.), Velikovsky cites antiquated comments by Ramsay and Murray made at the end of the 19th cent., comparing the lion gate of Myceanae to Phrygian monuments.[72] Lewis Greenberg has also attempted to confirm Velikovsky's argument.[73] Velikovsky arbitrarily takes radiocarbon dates for Pylos of 1200 B.C. and for Gordion, the Phrygian capital, of 1100 B.C. and reduces them to 800 and 700 B.C. respectively.[74] The historical argument for this reduction as supplied by Isaacson is that the Phrygians are not believed to have produced their distinctive culture until the 8th cent. B.C.[75]

But this comparison is quite unwarranted. Homer's

reference to the Phrygians may be dismissed as an anachronism. But we have contemporary Assyrian inscriptions which refer to the Mushki, the Assyrian name for the eastern branch of the Phrygians, in the region of Tiglath-Pileser I (1115-1077 B.C.).[76] Moreover excavations at Gordion by Rodney Young in 1965 uncovered strata from the late Hittite era (before 1200 B.C.), which yielded increasing amounts of Phrygian pottery.[77]

Ethnic and Linguistic Confusions

During a BBC filming at Princeton, Velikovsky was candid enough to object to a posed shot where he had to contemplate a book on Egyptian, saying: "People will say that I pretended that I read hieroglyphics, but I don't."[78] Yet for one who does not have even a basic training in Egyptian hieroglyphics, Velikovsky on the basis of his superior insight presumes in audacious innocence to correct the translation of perhaps the greatest of all Egyptologists, Adolph Erman![79]

He likewise betrays his ignorance of ancient languages when he comments: "Most probably the Hurrian people is but a creation of modern linguistics."[80] Hurrian, though a difficult and sparsely attested dialect, was a real language.[81] Velikovsky's remarks about the Hurrian kingdom of Mitanni also reveal confusion:

> . . . the whereabouts of the kingdom of Mitanni is not positively known. . . . There is reason to believe that this geographical assignment (in the neighborhood of Carchemish) is incorrect and that Mitanni was in northern Iran, where Herodotus in the fifth century before the present era described the people of Matiene: the Persian satrapy was near Mount Ararat.[82]

Though the site of the capital is not known, the area of Mitanni is well known.[83] Some have indeed speculated that the descendants of Mitanni eventually formed the kingdom of Urartu. But this was a later development and Urartu was far to the north of the earlier area of Mitanni.[84]

Despite his obvious ignorance of ancient languages, Velikovsky makes some startling claims regarding the Hittite pictographs: "In my reconstruction I come to the conclusion that they are Chaldean signs, not Hittite. I also expect unequivocal evidence that these signs were used down to the last century before the present era."[85] The Hittite Hieroglyphs, which are to be dated to the late 2nd and early 1st millennium B.C. have been analyzed by Bossert and other scholars as representing a dialect of Luwian, closely akin to the Hittite represented in the cuneiform script.[86] They certainly had nothing to do with the Chaldeans who flourished in lower Mesopotamia.

Undeterred, however, by conventional history Velikovsky informs us: "Owing to the confusion in the conventional chronology, the Chaldean writings of the Neo-Babylonian Empire are ascribed to early centuries and an imaginary empire."[87] In a prospectus of future volumes in his projected series, *Ages in Chaos,* we are informed that Velikovsky will demonstrate that "the 'Hittite Empire' is a mythical construct from the Chaldean archives and the Chaldean remains of the Neo-Babylonian Empire."[88] Confusion is compounded and multiplied when one dispenses with 500 years of history by dismissing entire empires!

Conclusion

Such is Velikovsky's supreme confidence in his reconstruction that we can expect future volumes that will radically rewrite ancient history. His grand design has some of the features of an aerial balloon. It can lift the believer to lofty heights with an exhilarating view that transcends petty disciplinary boundaries. At the same time like a balloon it is a flimsy, insubstantial structure, vulnerable, and filled with gas.

Velikovsky's reconstruction is a catastrophic history in a double sense. It is a history based upon catastrophes, and it is a disastrous catastrophe of history.

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FOOTNOTES

[1]For the controversy see A. de Grazia, ed., *The Velikovsky Affair* (New Hyde Park N.Y.: University Books, 1966).

[2]Hereafter the following abbreviations will be used:
AC for *Ages in Chaos*
EU for *Earth in Upheaval*
OA for *Oedipus and Akhnaton*
WC for *Worlds in Collision*

[3]Available from P.O. Box 414, Portland, Oregon 97207. Five of ten interdisciplinary issues on Velikovsky have thus far appeared. Though the editors have taken a sympathetic, and even defensive attitude toward Velikovsky's views, critical articles have also been published. Hereafter the following abbreviations for the issues of this magazine will be used:

P I for *Pensée*	(May, 1972)
P II for	(Fall, 1972)
P III for	(Winter, 1973)
P IV for	(Spring-Summer, 1973)
P V for	(Fall, 1973)

[4]See P III, 37-38 for a list of such courses.
[5]Joseph May, "A Call to Action," P II, 47-48.
[6]WC, *passim*; EU, pp. 200, 261.
[7]P I, 8.
[8]P I, 11 ff.
[9]P II, 36.
[10]I.Velikovsky, "The Pitfalls of Radiocarbon Dating," P IV, 12; cf. A. Burgstahler and Euan MacKie, "*Ages in Chaos* in the Light of C14 Archaeometry," P IV, 33-37, 50. Cf. also J. Johnston, "The Problems of Radiocarbon Dating," *Palestine Exploration Quarterly,* 105 (1973), 13-26.
[11]H. S. Smith, "Egypt and C 14 Dating," *Antiquity,* 38 (1964), 32-37.
[12]W. F. Libby, "The Radiocarbon Dating Method," P IV, 7-11.
[13]WC, p. 330.
[14]O. Neugebauer, "The Origin of the Egyptian Calendar," *Journal of Near Eastern Studies,* 1 (1942), 396-403; and R. Parker, *The Calendars of Ancient Egypt* (Chicago: University of Chicago Press, 1950).
[15]EU, p. 276.
[16]Carl W. Blegen, "The Principal Homeric Sites: Troy," in A. J. B. Wace and F. H. Stubbings, eds., *A Companion to Homer* (London: Macmillan and Co., 1962), pp. 373, 383; *idem, Troy* (N.Y.; Praeger, 1963).
[17]S. Piggot, *Prehistoric India* (Baltimore: Penguin Books, 1952); M. Wheeler, *Early India and Pakistan* (N.Y.: Praeger, 1959).
[18]G. F. Dales, "Civilization and Floods in the Indus Valley," *Expedition,* 7 (Summer, 1965), 10-17; *idem,* "The Decline of the Harappans," *Scientific American,* 214 (May, 1966), 92-100.
[19]A. Heidel, *The Gilgamesh Epic and Old Testament Parallels* (Chicago: University of Chicago Press, 1949).
[20]WC, p. 61.
[21]M. Mallowan, "Noah's Flood Reconsidered," *Iraq,* 26 (1964), 62-82.

[22]EU, p. 191.
[23]R.W. Hutchinson, *Prehistoric Crete* (Baltimore: Penguin Books, 1962).
[24]D. L. Page, *The Santorini Volcano and the Destruction of Minoan Crete* (London: Society for the Promotion of Hellenic Studies, 1970); N. Platon, *Zakros* (N.Y.: Charles Scribner's Sons, 1971).
[25]J. V. Luce, *Lost Atlantis* (N.Y.: McGraw-Hill Book Co., 1969).
[26]W.C. p. 140.
[27]K. Kenyon, *Digging Up Jericho* (N.Y.: Praeger, 1957).
[28]Cf. E. Yamauchi, *The Stones and the Scriptures* (Philadelphia: J. B. Lippincott, 1972), pp. 48-57.
[29]J. Van Seters, "A Date for the 'Admonitions' in the Second Intermediate Period," *Journal of Egyptian Archaeology*, 50 (1964), 13-23.
[30]P III, 36.
[31]WC, p. 130; AC, p. 61.
[32a]AC, p. 99.
[32b]AC, p. 53.
[33]AC, p. 99.
[34]For the Hyksos, see: T. Save-Soderbergh, "The Hyksos Rule in Egypt," *Journal of Egyptian Archaeology*, 37 (1951), 53-71; J. Van Seters, *The Hyksos* (New Haven: Yale University Press, 1966); D. B. Redford, "The Hyksos Invasion in History and Tradition," *Orientalia*, 39 (1970), 1-51.
[35]Cf. P. Montet, *Le Drame d' Avaris* (Paris: P. Geuthner, 1941); *idem, Egypt and the Bible* (Philadelphia: Fortress Press, 1968); E. Uphill, "Pithom and Raamses," *Journal of Near Eastern Studies*, 27 (1968), 291-316; 28 (1969), 15-39.
[36]A thesis accepted by C. H. Gordon, P II, 30-32.
[37]OA, p. 57.
[38]OA, pp. 51 and 54.
[39]OA, p. 95; cf. p. 69.
[40]OA, p. 206.
[41]M. Murray, *The Splendour That Was Egypt* (N.Y.: Praeger, 1964), pp. 70 ff. Cf. J. Černy, "Consanguineous Marriages in Pharaonic Egypt," *Journal of Egyptian Archaeology*, 40 (1954), 23-29
[42]The citation of recent studies of their mummies in P II, 30, ignores this point. Cf. C. Desroche-Noblecourt, *Tutankhamen* (N.Y.: Graphic Society, 1963), pp. 120 ff.; C. Aldred *Akhenaten* (N.Y.: McGraw-Hill Co., 1968), pp. 68, 97-99.
[43]OA, p. 54, fn.
[44]Aldred, p. 107.
[45]AC, pp. 229, 332. In P IV, 50, Velikovsky reaffirms this dating.
[46]AC, p. 232.
[47]AC, p. 312, fn.
[48]Y. Aharoni, *The Land of the Bible* (Philadelphia: The Westminster Press, 1967), pp. 68-69.
[49]Cf. *ibid.*, pp. 157-69; E. Campbell, "The Amarna Letters and the Amarna Period," *The Biblical Archaeologist*, 22 (1960), 2-22.
[50]J. Bottéro, *Le probleme des Habiru* (Paris: Cahiers de la Société asiatique, 1954); M. Greenberg, *The Hab/piru* (New Haven: American Oriental Society, 1955).
[51]Cf. W. Stiebing, Jr., "A Criticism of the Revised Chronology," P V, 10-12; and A. Burgstahler, "The El-Amarna Letters and the Ancient Records of Assyria and Babylonia," P V, 13-15.
[52]AC, pp. 310 ff. Cf. G. Cameron, "The Annals of Shalmaneser III King of Assyria," *Sumer*, 6 (1950), 6:26; E. Michel "Die Assur-Texte Salmanassars III (858-824)," *Welt des Orients*, 2 (1954), 27-45; 2 (1955) 137-57; 2 (1956), 221-33; 2 (1959) 408-15.
[53]Cf. M. Unger, *Israel and the Aramaeans of Damascus* (London: James Clarke & Co., 1957).
[54]AC, p. 104.
[55]AC, p. 124.
[56]J. Greenfield, "The Small Caves of Qumran" *Journal of the American Oriental Society*, 89 (1969), 138.
[57]G. W. Van Beek, "Myrrh and Frankincense," *The Biblical Archaeologist*, 23 (1960), 70-95.

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[58]AC, p. 104.
[59]AC, pp. 174-75.
[60]P IV, 41.
[61]B. Maisler, "The Campaign of Pharaoh Shishak to Palestine," *Vetus Testamentum Supplement*, 4 (1957), 57-66; S. Yeivin, "Did the Kingdom of Israel Have a Maritime Policy?" *Jewish Quarterly Review*, 50 (1960), 193 ff.; Aharoni, pp. 283-90; see especially K. Kitchen, *The Third Intermediate Period in Egypt* (1100-650 *B.C.*) (Warminster: Aris and Phillips. Ltd., 1973), pp. 294-300, 432-447.
[62]EU, p. 277.
[63]P V, 8. His further contention that only steel could be used to cut diorite and that copper or bronze could not have been used to cut the limestone blocks of the pyramids is refuted by a study which he cites, but evidently does not believe: A. Lucas, *Ancient Egyptian Materials and Industries* (London: Edward Arnold, 4th ed., 1962).
[64]F. J. Forbes, *Bergbau, Steinbruchtätigkeit und Hüttenwesen* (Göttingen, 1967), p. 17.
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[66]Cf.E. Yamauchi. "Homer, History and Archaeology." *Bulletin of the Near East Archaeological Society*, 3 (1973), 21-42.
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[74]P IV, 50.
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[76]D. Luckenbill, *Ancient Records of Assyria and Babylonia* (Chicago: University of Chicago Press, 1926), I, 74; R. D. Barnett, *Phrygia and the Peoples of Anatolia in the Iron Age* (Cambridge: Cambridge University Press, 1967), p.7.
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The Relationship between Immanuel Velikovsky and Christian Catastrophists

CHARLES McDOWELL
Cuyahoga Community College
Parma, Ohio 44130

Introduction

Two decades have passed since Immanuel Velikovsky released his book called *Worlds in Collision.* The work, which received considerable popular acclaim, maintained that in the fifteenth and eighth centuries B.C. the Earth experienced catastrophes of global proportions. Velikovsky argued that the source of these global holocausts was a massive near-approaching comet which finally collided with Mars, lost its tail and became the planet Venus. Later catastrophes occurred, one of particularly great significance in 687 B.C. when Mars nearly collided with the Earth due to the fact that the comet had shifted it into an orbit closer to the Earth.

Such concepts caused a storm of protest in American circles, much of it being absurd. The reader will find in our footnotes suitable leads to pursue such information as needed.[1]

Our purpose here is to note that out of this academic upheaval ultimately permanent changes occurred in intellectual circles including the Christian. Velikovsky, whether right or wrong in his individual applications, introduced the idea that the source of great catastrophes in antiquity was outside of the Earth itself. The academic community which largely subscribed to the idea of evolution posited the concept that the solar system had been untouched by cosmic disturbances for eons of time. With this premise as a fundamental assurance, the scientists could securely proclaim that processes that go on in nature in the present age were the same processes with the same magnitude which occurred for eons of time. This is the heart of *uniformitarianism,* the intellectual foundation of organic evolution.

This paper must depart, however, from these introductory remarks to consider specifically the relationship between Velikovsky's concepts of catastrophism and concepts of catastrophism held by representative Christian writers. Representative positions will be used because a short paper cannot begin to cover all of the published materials on Biblical catastrophism. Accordingly, this paper reflects largely the concepts of Henry Morris, Donald W. Patten and my own. The writer makes the assumption that only theistically controlled catastrophism is to be compared with the system of Immanuel Velikovsky. This study vies for attention by means of the proposition that in a very recent and an extremely short period of time all aspects of the history of all forms of organic life were accomplished.

The comparisons are made at several topic levels: namely creation, the flood, and post-flood catastrophes. Accordingly, the views of the separate writers will be considered on each of these topics.

Comparative Views on Creation

Velikovsky on Creation

Very significantly we do not find Velikovsky referring to the beginnings of the solar system or the universe. Velikovsky was not concerned about beginnings, only change in the solar system which affected the Earth. Velikovsky assumed evolution is a fact but disputed the mechanisms as to how those evolutionary processes were accomplished.

Velikovsky leaned heavily upon two British cosmologists, W. H. McCrea and R. A. Lyttleton.[2] McCrea has theorized that no planet could have originated inside the Jovian orbit, given a nebular hypothesis. Lyttleton put forth a complementary theory noting that the terrestrial planets originated from Jupiter through disruption caused by too rapid rotation when Jupiter was formerly much larger than at present. Thus Velikovsky believes in a nebular hypothesis with stages of development for the inner terrestrial realm. By Lyttleton's model Velikovsky would make the Earth older than Venus.

Henry Morris on Creation

Henry Morris is an engineer who has concerned himself to a considerable degree in his professional career of teaching with hydraulic engineering. In a team effort with John C. Whitcomb Jr., Morris and Whitcomb put forth a significant concept when they stated that the Earth and the organic life upon it were created with the "appearance of age."[3] Morris' view of instantaneous maturity of all organic life is a logical approach to a creation process which spans only six days.[4] Furthermore by virtue of this six-day creation Morris handily disposes of the "gap theory" which assumes there were pre-Adamic forms of life on the Earth, all of which were destroyed by floods or judgments in the so-called interval between Genesis 1:1 and 1:2.[5] Certainly the Hebrew text of Genesis 1:1-2 would seem to support the "gap theory" *only if it is seriously distorted by means of unsound principles of syntax.* However, Morris does state "The first verse, incidentally is not a dependent clause (i.e. "in the beginning, when God was creating . . . the earth was without form . . .")"[6] Genesis 1:1 cannot be treated incidentally and a closer look is required in this paper.

Morris, then, assumes a "full grown" universe is accomplished within 6 days and that this system of matter, space, and time continues with the present principles of conservation and deterioration governing everything in the physical universe. Our space is too brief to include Morris' applications of these principles, the first and second laws of thermodynamics. We must confine ourselves to note that he finds that no empirical exceptions are to be found to these principles. There is no illustration of anything now being created. On the other hand, we find an original creation running down or wearing out.[7] Morris believes that evolution is impossible because no instance of gradual development from the simple to the complex organization can be found.

Donald W. Patten on Creation

The astronomer-geographer Donald W. Patten approaches the origins of the Earth from the standpoint of (1) showing the impracticality of the heliogenesis theories and (2) ascribing the origin of the Earth and many of the planets, especially the Jovian, to galactogenesis.[8] Patten believes that the Sun with an immense gravity and high galactic speed may have overtaken celestial bodies which had an origin entirely separate from our solar system.[9]

Patten approaches this theory of galactogenesis from the standpoint of what is possible in terms of celestial mechanics. As far as the Earth is concerned, he believes that an Earth-Moon binary, which spent considerable astronomical time outside our solar system, was gravitationally swept into the present solar family.[10] Patten postulates that around 10 million years ago the Earth-Moon system came across the outer fringes of the Sun's domain and gradually was influenced to take present proximate location and orbit about 100,000 B.C.[11] During the next 95,000 years vast quantities of ice were melted, the seas were formed, the atmosphere and climate were organized. Also, during this span of time catastrophes occurred and "ammonias, hydroxyls, hydrocarbons and related compounds were deposited upon the Earth, resulting in strata of coal, pools of petroleum, and additional volumes of nitrogen in the atmosphere."[12] Within the atmospheric structure a canopy was developed which produces a global greenhouse effect.

Velikovsky, whether right or wrong in his individual applications, introduced the idea that the source of great catastrophes in antiquity was outside of the Earth itself.

In the period from 12,000-2,800 B.C., Patten maintains, "the major part of the Earth's biology was created." Earlier phases of organic life which he attributes to the lower levels of the geological table were created chiefly in the period from 20,000-12,000 B.C.[13] The Pattenian system of course precludes any form of evolution. It also gives rational explanations for the heterogeneous character of the solar system, a character which still embarrasses many astronomers.

McDowell on Creation

My own views on creation grow out of my understanding of the Hebrew text of Genesis 1:1-2. I render the text as follows: "When God began to fashion the heavens and the Earth, the Earth was unorganized and empty with darkness upon the surface of the seas and the wind of God swept over the waters."

This is not the place to debate the merits of this or any other translation. For those interested in the grammar and the syntax that I follow, it is simply a case of recognizing that the first two words are in construct relationship, rather than absolute forms. Manifestly, according to this view, which is as old as Medieval Hebrew grammarians, Genesis 1:1 is a dependent clause.

If the Masoretic text is allowed to speak for itself, there can be no doubt that the Earth was already in existence and that the first chapter of Genesis concerns itself with a renovating of the Earth for the purpose of making it a suitable place for organic life and especially for man who is the crowning achievement of the created forms of life. No indication is given for the age of the Earth. In this very terse explanation of Genesis 1, I must allude to the fact that I can in no way see how a "creation out of nothing" (*creatio ex nihilo*) can be attributed to the text. The Masoretic Hebrew text could, of course, be emended so that the first word would be in an absolute state to read "In the beginning". But the accepted text reads quite literally "In the beginning of created God" etc. "In the beginning of" is adverbial, modifying the verb and must be given the temporal sense as I have rendered it above. Furthermore, while I hold to the fact of the creation process being completed in 6 consecutive solar days, I will go no further than what the text bears out. The word for creation (*bara*) means in Semitic languages to shape or fashion material items. Genesis 1:27 uses it three times to describe the creation of man and woman. Those who insist on creation out of nothing should remember where man and woman came from (Genesis 2:7-22).

Paramount in my understanding of Genesis 1, is the nature of the firmament which consists of the upper waters while the seas comprise the lower waters (Genesis 1:6-10). Both Morris and Patten believe that the upper waters consisted of a vapor canopy which

afforded protection to the inhabitants of the Earth. However, I regard the *raqia* as the linguistic equivalent of the Indo-European torque (as it appears in English) and, therefore, as a collar, ring or disk. In the physical sense, then, I believe the firmament consisted of orbiting rings similar to those of Saturn.

The present writer links the formation of the rings of the Earth with a Pattenian type of solar system and celestial mechanics, one in which changes were induced by new elements being added to the solar system. I do not propose at this juncture which member of the solar system disrupted the oceans of the Earth gravitationally; nevertheless, I hold that astronomical quantities of water, sand gravel, and solubles were swept into orbit where, following glacioseparation (separation by freezing), the glacioseparatives took up individual orbits according to their specific gravities.

For the description of the waters which are above the heavens I would call our attention to the Hebrew word *chug (ḥug)* which means circle and which is used to describe the heavens in Job 26:10, 22:14, and Isaiah 40:22. If we were to render this word in Indo-European languages, especially Greek, we would have to recognize that sometimes the *h* would appear as *ch* (Greek *chi*) and sometimes it would drop. I assume that it did drop in the case of Oceanus, the Earth-encircling stream. Oceanus could be derived from Oc/g + ean + us.

The orbiting ice rings of Saturn have been captured (i.e., Patten) or have been pulled off Saturn itself. Velikovsky maintains tersely that Saturn was once disrupted by Jupiter. While Velikovsky is interested in such disruption for other reasons, I assume that this type of disruption could have swept some light materials into orbit.[14] It is significant that the rings are above the equator, the place where the centrifugal forces would be concentrated especially on a rapidly rotating planet. Not to be forgotten are the bands on Saturn which are parallel to the equator and, therefore to the rings. I propose they consist of materials which were hurled into suborbital arcs and as they returned to the surface of Saturn, the materials were distributed in bands parallel to the equator.

The possibility of the disruption of a planet occurring over the equator is not without further possible examples in the solar system. The two satellites of Mars, Phobos and Deimos, orbit almost precisely above the equator. The speed at Mars' equator is not high. If Mars' centrifugal forces were augmented by considerable gravitational forces, such as from the Earth on a close sweep, it is conceivable that the disruption might include the lift off of sizeable materials. Nonetheless, Uranus provides the most interesting set of circumstances. Its axis is tilted at 98°, almost lying in its orbital plane. The planet spins very rapidly: 10 hours plus 49 minutes. Additionally, the five satellites are found over the equator, an arrangement that might be expected if the planet were disrupted by outside forces.

Returning to the Earth model, I note an additional aspect of the rings orbiting the Earth. I believe that Patten is correct in stating that an old antediluvian position of the Earth's axis was approximately from Nigeria to Samoa and that the former equatorial zone is to be determined in relation to the circum-Pacific orogenetic patterns.[15] This old equator approximated a circle arcing over Alaska at its greatest poleward extent in the Northern Hemisphere. It is along this old equatorial zone that, I believe, the more vastly deep, global ocean of the primeval Earth was disrupted. It is over this former equatorial zone that astronomical quantities of water, solubles, and items in suspension were swept into space, some to orbit the Earth, some to escape its gravitational control.

On the matter of mechanism I confess that I cannot identify at the present time in terms of sound celestial mechanics the object which gravitationally disrupted the Earth.

Comparative Views on the Flood

Velikovsky on the Flood of Noah

Apparently Immanuel Velikovsky has had a manuscript on the Flood of Noah which he has held back for many years just as he did with the second volume of *Ages in Chaos*. In the preface to *Worlds in Collision* he remarked, "*Worlds in Collision* comprises only the last two acts of the cosmic drama. A few earlier acts—one of them known as the Deluge—will be the subject of another volume of natural history."[16] He suggests in the *Yale Scientific* that the folkloristic material links it with a near collision of Jupiter and Saturn.[17]

Velikovsky's delay in releasing materials is extremely disappointing but probably stems from internal inconsistencies within his manuscripts. No one should read, for example, his *Earth in Upheaval* which variously describes the action of water in less than global size floods and imagine that he is speaking about the Flood of Noah. Velikovsky is speaking about catastrophes he believes occurred after 1500 B.C. Nonetheless he links with these post 1500 B.C. catastrophes the eleventh tablet of the *Epic of Gilgamesh* which clearly deals with the Deluge. [18] Sad to say Velikovsky attempted to prove cataclysmic evolution in his *Earth in Upheaval.*[19] All he really proved was cataclysmic extinction of various forms of life.

In 1969 Velikovsky became a little more specific on the mechanisms of the Flood. He stated "In my understanding, less than 10,000 years ago, together with the Earth, the moon went through a cosmic cloud of water (the Deluge) and subsequently was covered for several centuries by water, which dissociated under the ultra-violet rays of the sun, with hydrogen escaping into space."[20] We are still left, however, without the details of the effects of this situation upon the Earth.

Morris on the Flood

In addition to presenting justification for a global flood, Morris assumes that the canopy theory provides the source for the rains that lasted forty days (Genesis 7). It is his belief that an antediluvian vapor blanket "at a high elevation in the lower atmosphere"[21] would be out of reach of ordinary condensation nuclei. Thus unusual conditions would have to prevail to cause precipitation. Morris verges on astro-catastrophism by proposing that the Earth passed through a meteorite swarm but also allows for sudden vulcanism which filled the atmosphere with dust particles which would provide the necessary hygroscopic nuclei.[22]

In the view of this analyst, Morris' chief contribution to the understanding of the Flood of Noah is the suggestion that the order of the burial of life forms in the strata of rocks making up the geological table was dependent upon the principle of the hydrodynamic selectivity of moving water.[23] This principle governs the

deposition of materials according to their similarity of size, shape, and specific gravity: in other words according to the amount of drag offered to the water. Thus, according to Morris, the deposition process first laid down simple organisms near the bottom of the sediments and segregated more complex forms into distinct faunal and floral stratigraphic horizons which has given the appearance of evolution of similar organisms in successively higher strata.

Morris' analyses of sedimentary deposits also highlights the importance of beds of evaporites, namely salt, gypsum and anhydrite. These monomineralic deposits are frequently claimed to be the by-products of long term evaporation of inland seas or lakes. Of particular interest are salt plugs or domes. Concerning the latter, Morris says, "It would seem the height of absurdity to imagine that these huge thicknesses of salt had been built by evaporation of standing water."[24] Generally the domes and plugs are thought to be intrusive elements in the sedimentary layers. Morris supposes the deposits are to be attributed to the creation period and that ". . . the intrusions forming the salt domes being associated with the other volcanic and tectonic activity during the Deluge."[52] This writer assumes they are indeed associated with the Deluge and also not evaporites but glacioseparatives.

Patten on the Flood

Patten's basic views on the Flood, which are highly unique, are contained in *The Biblical Flood and the Ice Epoch*. Patten assumes that the source of the ice is ultimately "from the remote, cold, ice-abundant outer regions of our solar system or in galactic regions beyond."[26] The ice was transported by an astral visitor, Mars or Mercury, either in the form of an icy satellite or orbiting ice rings. This celestial visitor approached the Earth and lost the ice it was transporting to the superior field of gravity exerted by the Earth. Under the influence of the magnetic field, the ice, whether from rings or a disrupted ice satellite, became electrically charged and most of it was deflected by the Earth's magnetic field.

The effects upon the Earth were of staggering proportions. The electrically charged particles of ice were guided mainly around the magnetic poles in the Earth's present high altitudes. Some slop-over in the middle latitude caused the precipitation of the vapor canopy which Patten like Morris assumes was in existence. From the combination of the melting ice particles, a condensed vapor canopy, and rapidly melting ice sheets formed around the magnetic poles, plus water from the fountains of the deep, the sources for the flood waters are provided by Patten. The rupture of the floor of the oceans to open the fountains of the deep leads us to one of the remarkable insights of Patten concerning mountain building.

Patten contends that during this catastrophic year of the Deluge, global mountain chains that bear direct geometric relationships to old equatorial belts were lifted up as the result of the gravity of the astral visitor acting upon the fluid contents (magma) of the Earth. The stress would have been maximum on a rotating object at the equator. Accordingly, Patten contends that the Alpine-Himalayan and circum-Pacific zones of mountains are indicators of brief but catastrophic stress periods along these zones.[27] He assumes that the astral intruder that transported the ice made two sweeps

This paper reflects largely the concepts of Henry Morris, Donald W. Patten and the author—theistically controlled catastrophism—in comparison with the system of Immanuel Velikovsky.

past the Earth to build these orogenic zones. The first sweep came at the beginning of the Flood and produced the circum-Pacific zone; the second came at the close of the Flood. With each sweep of the visitor the axis of the Earth was radically moved.

Of profound significance is Patten's linking this orogeny with the ice dump-flood catastrophe. In Washington State ice is found sandwiched between igneous layers of rock. In Patten's view, as lava was bleeding from the Earth, simultaneously ice was being dumped upon the Earth. Accordingly, if vulcanism and the formation of ice sheets can be put together in the Northern Hemisphere, we might expect the same for the Antarctic ice sheets. Such expectations have been realized with the recent announcements that "tell-tale traces of 25 major volcanic eruptions and 2000 other minor outpourings . . ." have been found in an ice core taken from these ice sheets.[28]

McDowell on the Flood

It is my view that in large measure the orbiting rings which have been described above were deprived of their orbital velocities by (an) astral intruder(s) and that the ice, glacioseparatives, sands, and gravel came cascading down upon the Earth. Some struck the Earth with high velocities, some with low velocities, being affected by the magnetic field.

In relation to stratigraphy it is my view that there was temporary entombment of large numbers of specimens of continental fauna and flora. The seas were emptied by huge tidal waves and the marine life was typically deposited first according to Morris' principles of hydrodynamics. This action was followed by the thawing of the piles of space debris, some having formed mountainous heaps and ridges. The uncovered but deeply frozen life forms of the continents then were gathered by the rushing waters and later deposited according to the principles of hydrodynamic selectivity.

The role of one of the glacioseparatives is noted, namely salt. It was the major chemical soluble of the primeval ocean, and in the process of the destruction of the orbiting rings, huge deposits of the intensely chilled materials were covered rapidly by the rushing seas. After the sedimentation process was completed, these chilled materials absorbed the heat of the Earth, expanded and intruded through the beds above in the forms of salt domes and plugs. Morris is quite right in stating that the evaporites (glacioseparatives) must be linked with "catastrophic environmental factors associated with the Flood.[29] I follow Patten's ideas of mountain building under the influence of an astral intruder. However, while I see the logic of having life forms created as early as 12,000 B.C. and entombed by subsequent catastrophes before the Flood of Noah, I believe that the geological table can best be defined in terms of its association with the Flood of Noah. I

believe, therefore, that the circum-Pacific and Alpine-Himalayan uplifts came late in the Flood year after the sedimentation process was essentially complete.

The flood requires, I believe, an agent to keep tides moving across the face of the Earth in order to bring about pan-continental deposition from the bottom to the top of the geological column. To me this can mean only a satellite and therefore, the Moon. The combined effort of the Moon and another intruder (and I believe this would be Mars) could have produced the tidal forces necessary to produce the mountain uplifts at the end of the Flood.

The role of the Moon as just cited could come about, it would seem, only through the process of the Earth capturing it. Reciprocal effects would be produced on the Moon with extensive mountain building, widespread outpourings of lava and, above all, the Earth's powerful magnetic field would have produced the ubiquitous remanent (fossil) magnetism now found in the formerly heated lunar rocks.[30] Of great interest to me is the fact that the Moon is not mentioned in the Scriptures before Genesis 7:11 even though the name for it is a common Semitic word. Therein we read "In the six hundredth year of Noah's life, in the second Moon, the seventeenth day of the Moon . . ."[31] I submit for consideration that this refers to the capture process of the Moon.

Finally in relation to the Flood this writer feels the reason for the Divine judgment should be discussed, even if briefly. The Book of Jubilees (5:1-8) calls the sons of God of Genesis 6:1-4 angels of God. It relates that the union of the angelic beings and women resulted in offspring which were giants. The angels also had sexual relations with animals so that the flesh of both men and animals was altered. Indeed the animals are said to have left their original orders. As for mankind, besides the Naphilim which are mentioned in Genesis 6:4, Jubilees 7:22 mentions beings who are called Naphidim which were all unlike. Additionally there was a third group of offspring called Eljo. These three groups are enumerated as distinct from original mankind. There can be no doubt that the teaching of this Jewish book is that the intermingling of the humans and the angels produced biological mutants, beings who were substantially different from the human race.

A fresh look at Genesis 6 is in order. Genesis 6:20 and 7:14 note the animals that were admitted to enter the ark were *after their kind.* Presumably this means that there was to be no variation from the biological kinds or species as described in Genesis 1:24. Genesis 6:12 as stated in the King James Version states that "all flesh had corrupted his way upon the earth." The verb used here also has the meaning in Hebrew "to be marred," "to be injured," or "to be perverted." This leaves us with the possibility that the judgment is a rescue of the remaining men and animals, who are still of the original orders of creation, from being engulfed by interbreeding into the new mutant forms. Accordingly, Genesis 6:9 should be noted carefully. The Hebrew text says that Noah was "complete in his generations." In other words he was completely a human being.

Comparative Views on Post-Flood Catastrophes

Velikovsky on Post-Flood Catastrophes

Velikovsky concerned himself chiefly with post-Flood catastrophes in his several published works, namely, *Worlds in Collision, Ages in Chaos,* and *Earth in Upheaval.* As we have already noted previously, Velikovsky believed a cosmic upheaval occurred which accounted for the origin of Venus as a comet from the planet Jupiter which had become unstable due to excessive rotational speeds.

The impact of Velikovsky's ideas was far-reaching. In the physical sciences he called for a reassessment of the influence of the gravitational field of the sun upon the movement of the planets especially when there was evidence that the planets had changed orbits, including the Earth; that both the geographical position of the Earth's axis and its astronomical direction changed; that when the Earth's atmosphere came in close contact with the comet Venus or the atmosphere of Mars, extraordinary electrical discharges took place, and to highlight just one more item in a long list of influences in the physical realm, that Joshua's ordering of the Sun and Moon to stand still was not just "a tall tale for the credulous."[32] The foregoing concepts along with others too numerous to elaborate upon here called for new principles of celestial mechanics. Velikovsky became skeptical about the "accepted celestial mechanics" which he maintained would be true only if the Sun "is as a whole an electrically neutral body."[33] Convinced that the solar system was filled with electrical charges, Velikovsky believed that the diurnal rotation of the Earth could be impeded or stopped "by the Earth's passing through a strong magnetic field."[34] It is appropriate, therefore, that Velikovsky began the list of the post-Flood catastrophes with the story of the Sun and the Moon standing still as recorded in Joshua 10.

But Velikovsky also concerned himself with a reordering of the events of history during the comet stages of Venus in his second work entitled *Ages in Chaos.* To him the great problem of the history of antiquity was to find the link(s) between the histories of Egypt and Israel. Of concern to the historians was the fact that such a notable event was not found recorded in Egyptian annals.

Velikovsky proposed that the Papyrus Ipuwer which had been declared to be a collection of proverbs written at the end of the Old Kingdom period was actually a text describing cataclysmic events paralleling those in the Exodus account.[35] Furthermore, he proposed that under the circumstances of national impotence the Hyksos, whom Velikovsky identified with the Biblical Amalekites, entered Egypt and remained in control until the time of Saul and David of Israel. By this chronological shuffling, Velikovsky makes the Israelites responsible for the rise of the New Kingdom of Egypt. According to him Saul effectively destroyed the major Amalekite garrison city by which they controlled Egypt.

The effect of this lowering of the Egyptian chronology approximates 500 years. Velikovsky fully expected the radiocarbon datings would justify his rearrangement of the Egyptian chronology. Indeed such dating methods of the Old and Middle Kingdoms typically showed the standard or conventional chronologies to be 500-800 years too old. For the New Kingdom radiocarbon datings suggest on an average, however, that the chronology should be lowered about 250 years. Nonetheless, recent tests on palm kernels and reeds from Tutankhamen's tomb tested out at 899 B.C. Velikovsky had suggested in his chronology ca. 840 B.C. for Tutankhamen.[36]

Morris on Post-Flood Catastrophes

Morris does not concern himself with the post-Flood catastrophes in the work entitled *The Genesis Flood.* There is a section in the appendix which deals with genealogies, expecially those of Genesis 11. The authors maintain that the Genesis 11 genealogical tables need not be interpreted as a strict chronology. At the same time they conclude that to allow more than 5000 years beween Abraham and the Flood "stretches Genesis 11 almost to the breaking point."[37]

Patten on Post-Flood Catastrophes

Patten differs considerably from Velikovsky on post-Flood Catastrophes, mainly in respect to two concepts. First Patten maintains that the cosmic intruder which caused a whole series of catastrophes after the Flood is to be identified with the planet Mars alone. This includes such events as the Sodom and Gomorrah catastrophe, the Exodus event, the Long Day of Joshua and others. Secondly, he maintains that the close passes of Mars by the Earth occurred with rhythmic regularity and, therefore, what can be called cyclic astronomical catastrophism.

Cyclic astronomical catastrophism is actually the product of a team effort, for Patten has been joined here in his efforts with Ronald R. Hatch. According to their solar system model, before 701 B.C. catastrophes occurred or threatened to occur on an average of 54 years. These cycles of astronomical catastrophes are linked with the involvement of Mars which had an orbital ellipticity of about 0.4, a comet-type orbit. They hold that Mars must have approached the Sun within 88 million miles, compared to Earth's 91.5 million miles. In its movement away from the Sun, Patten and Hatch believe that Mars reached its aphelion at about 206 million miles. This location was 55 million miles beyond its present aphelion and it coincided with the middle of the asteroid zone.

Patten and Hatch establish their rationale for the 54 year cycle of catastrophes on the basis of resonant orbits as found in connection with the movement of asteroids. Transferring this concept of orbital movement to Mars the rationale goes as follows: The inferior conjunctions of Mars (those when Mars was inside Earth's orbit, and the two planets were in alignment with the Sun) would be tied into a "resonant orbit" for Mars. A resonant orbit can be a stable orbit, and in this case the resonance was 2:1. Thus two Earth orbits equalled one Mars orbit. Patten and Hatch cite the resonant movement of three asteroids in 2:1 resonance with Jupiter to explain their model. These concepts are to be published in a work entitled, *The Long Day of Joshua and Other Post-Flood Catastrophes* scheduled for release in late 1973 or early 1974.

An additional word of clarification is needed for the orbital position of Mars before 701 B.C. The Patten-Hatch model is entirely different from Lynn Rose's model of Mars being an inner planet. Rose attempts to justify Velikovsky's model of the solar system which assumes that before the 9th century B.C. Mars was an inner planet which in its movement did not cross the Earth's path. Through a near collision with the comet Venus, a transfer of energy skewed its orbital motion into one which was highly elliptical, so that it began to periodically cross the Earth's path.[38] Rose proposes this model in order to explain why before the 9th century B.C. "Mars did not arouse any fears in the hearts of the ancient astrologers and its name was seldom mentioned in the second millenium . . ."[39]

McDowell on Post-Flood Catastrophes

I follow Patten and Hatch in their concepts of cyclic astronomical catastrophism. My concern in this area of investigation is the behavior of men. In a forthcoming work I will deal with the biblical period from Joseph to David.

I accept Velikovsky's lead in *Ages in Chaos* that the Egyptian chronology is in error but do not identify the Hyksos with the Biblical Amalekites. Instead, I recognize the Amorites as the Hyksos and present evidence for the fact that they controlled Egypt through most of 16th through the 14th cenuries.

I lower the Egyptian chronology on the basis of radiocarbon datings and a reassessment of the archaeological data from Egypt and the Aegean. I terminate the 19th Dynasty of Egypt, the Hittite Empire, the city of Ugarit, and the Mycenaean world during the reign of David. I also give reasons from the Dead Sea Scrolls and inscriptions in the Aegean why David nearly became involved in the Trojan War. Moreover I give reasons why the Mycenaean civilization is an extension of the cultural pool of the Southeast Mediterranean.

According to my chronological framework. the Exodus took place in the middle of the 15th century B.C. Akhenaton, whom Velikovsky placed in the 9th century B.C., I place in the 12th century B.C. Nevertheless, we agree that Moses antedates the New Kingdom of Egypt.

I depart completely from Velikovsky on the matter of the identity of Mars and Venus during this period. I present evidence that Mars is the same as Apollo, and Apollo is the same as Biblical and Ugaritic Baal. As for Velikovsky's remark about Mars not arousing fear in the hearts of ancient astrologers, I believe this is erroneous. Baal also goes by the name Addad/Haddad. This name can be traced back to the Flood.

I believe it is significant that Velikovsky has only four references in *Worlds in Collision* to Baal and even so he equates Baal, without explanation, to Venus. I also find it significant that Velikovsky shied away from Ugaritic tests which give so much elaboration on Baal. In a work now in preparation, I go into considerable detail about Baal being the planet Mars which periodically swept by the Earth. Patten's identification of the astral intruder with Mars has much stronger textual support than Velikovsky's Venus.

Conclusion

My remarks in this paper certainly do not constitute an adequate delineation of the present status of studies on catastrophism as influenced by Immanuel Velikovsky. Nonetheless, the remarks have been made with the hope that some overall perspective has been gained and that this perspective highlights the importance of catastrophism for an understanding of Earth history.

NOTES

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[24]*Ibid.* p. 413
[25]*Ibid.*
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[28]*Cleveland Press,* Friday, January 14, 1972.
[29]*Genesis Flood,* p. 417.
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[31]See also Genesis 8:4, 5, 13-14.
[32]*Worlds in Collision.* p. 381.
[33]*Ibid.*, p. 387.
[34]*Ibid.*, p. 386.
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The Astrophysics of *Worlds in Collision*

ROBERT C. NEWMAN
Biblical School of Theology
Hatfield, Pennsylvania 19440

Introduction

The solar system has been the scene of repeated catastrophes in the millennia preceding the time of Christ, according to Immanuel Velikovsky.[1] In his book *Worlds in Collision,* first published in 1950, the author concentrates on the two most recent alleged upheavals: our near collision with Venus about 1500 BC, and the close approach of Mars in the period 800-600 BC. In addition, Velikovsky gives a few hints that the deluge of Noah involved a similar phenomenon.[2] Jupiter also is thought to have figured prominently in some previous catastrophe.[3] Although Velikovsky apparently intended to devote another book to these earlier events, he seems to have been side-tracked by adverse reaction to *Worlds in Collision.*[4]

In any case, Velikovsky believes that Venus was formed by being thrown out of Jupiter during a near collision among the outer planets.[5] At first Venus became a comet with an elongated orbit extending from near Jupiter inward past the earth's orbit.[6] On several occasions in the midst of the second millennium BC, the comet Venus approached the earth, producing a variety of physical calamities, including destructive meteor showers,[7] extensive volcanic flows,[8] huge tidal waves,[9] the tilting of the earth's axis and changes in its speed of rotation,[10] as well as years of semi-darkness during which the sun was obscured.[11]

Velikovsky cleverly ties these phenomena to the events of the Exodus of the Israelites from Egypt and the conquest of Canaan: the ten plagues,[12] the crossing of the Red Sea[13] and the Jordan River,[14] the manna in the wilderness,[15] the smoke, fire and sounds at Mount Sinai,[16] the cloudy and fiery pillar,[17] the fall of Jericho,[18] the "hailstones"[19] and Joshua's long day[20] at Gibeon. Velikovsky also seeks to synchronize these calamities with the fall of Egypt's Middle Kingdom,[21] the migrations of several ancient peoples,[22] and the origin of a substantial amount of mythology in all parts of the world.[23]

Having disrupted the earth's motion, destroyed a number of civilizations, created several new religions, and dumped enormous amounts of manna (=nectar =ambrosia)[24] and petroleum[25] on the earth, the comet

Robert C. Newman has a Ph.D. from Cornell University in theoretical astrophysics (1967), as well as five years of graduate training in theology.

Venus continued to threaten the earth for centuries, although no further catastrophes occurred. Finally, about 800 B.C., Venus nearly collided with the planet Mars. As a result, the Martian surface was devastated and its orbit was disrupted, while Venus settled into a new orbit where it became a planet and no longer menaced the earth.[26]

Unfortunately, however, the new orbit of Mars now made it a threat to earth in place of Venus. Although the Martian upheavals were not so violent as the earlier Venerian calamities,[27] the red planet still succeeded in turning back the shadow on the dial of Ahaz,[28] wiping out the Assyrian hosts of Sennacherib besieging Jerusalem,[29] providing phenomena for the striking catastrophes mentioned by several of the Old Testament prophets,[30] changing the length of the month and the year,[31] influencing the outcome of the Trojan War,[32] and adding a new war god to the pantheon of many pagan religions.[33]

Velikovsky and Christianity

It should be clear from this sketch of Velikovsky's reconstruction of ancient history that his work is a matter of concern for Christians. Although he gives a certain amount of historical credit to the Old Testament narratives, Velikovsky is no believer in supernatural revelation.[34] Instead he seeks to give a purely naturalistic explanation for the biblical events just as he does for the pagan mythology.

Some Christians, however, have been impressed by the fact that Velikovsky repudiates the uniformitarian outlook of science and that he admits the historicity of certain biblical catastrophes. Among several Christian writers who seem to have been influenced by him, one in particular—Donald W. Patten—seems to have attempted a "Christianization" of Velikovsky's general outlook in his work *The Biblical Flood and the Ice Epoch*.[35] As a result, a number of astrophysical problems in Velikovsky's work are shared by that of Patten.

Problems of Orbital Mechanics

In an article of this nature, there are severe limitations of space. Therefore we confine this discussion to two major areas of Velikovsky's astrophysics: orbital mechanics and rotational mechanics.

Velikovsky spends several pages discussing the old nebular and tidal theories for the origin of the solar system, finding them both inadequate.[36] It is a fact that the problem of the origin of the solar system is a difficult one, but many of the problems raised by Velikovsky have been solved.[37] Indeed, it seems that an excellent fit can be made between Genesis 1 and Hoyle's model for the formation of the solar system.[38]

Patten's alternative model is to suggest that the planets were randomly captured by our sun from interstellar space.[39] While Velikovsky does not explicitly commit himself to such a scheme, he does suggest that the present orbits of the planets are due to near collisions which involved drastic changes in the orbits of Venus, Mars and several of the outer planets.[40]

But there are two very serious problems of orbital mechanics which must be faced by such random-capture or collision views. (1) The planetary orbits all lie very nearly in the same plane, and (2) these orbits are all very nearly circular.

Relative to the orbital plane of the earth, the orbital planes of the other planets are tilted by the amounts indicated in Table I. If the planets were randomly captured or involved in numerous collisions, we would expect their orbital planes to be randomly oriented, but they are not. To indicate just how unrandom the orientation is, let us calculate the probability that the planets would have as little tilt as they do if they had been captured randomly. The total probability is just the product of the probabilities for each planet separately.

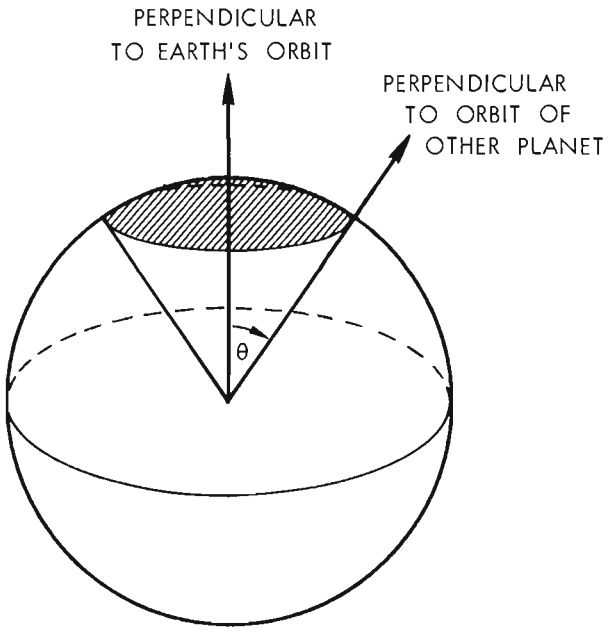

Figure 1. Probability that a given planet captured randomly would have orbital plane with tilt relative to orbital plane of earth that is equal to Θ or smaller is given by ratio of surface area shaded to surface area of entire sphere, i.e., $P=\frac{1}{2}(1-\cos\Theta)$.

TABLE I

Planet	Angle of Tilt (Θ)	Cos (Θ)	Probability
Mercury	7.0°	0.9925	0.0038
Venus	3.4°	0.9982	0.0009
Mars	1.9°	0.9995	0.0003
Jupiter	1.3°	0.9997	0.0002
Saturn	2.5°	0.9990	0.0005
Uranus	0.8°	0.9999	0.0001
Neptune	1.8°	0.9995	0.0003
Pluto	17.2°[41]	0.9553[42]	0.0224

The probability for a single planet can be calculated with the help of Figure 1. Drawing a sphere whose equator is the earth's orbit and whose vertical is perpendicular to that orbit, then a planet with orbital plane tilted by an angle Θ has its perpendicular fall somewhere on the cone shown in Figure 1. Any planet with less tilt has a perpendicular lying within the shaded area. Therefore the probability that a randomly captured planet has a tilt less than or equal to Θ is just the ratio of the shaded area to the area of the whole sphere. Without going through the derivation, this ratio and probability is

$$P = \tfrac{1}{2}(1 - \cos\Theta)$$

The result for each planet is given in Table I. The total

probability is

$P_{tot} = (P_{Merc}) (P_{Ven}) (P_{Mars}) \ldots (P_{Pluto})$

which is $P_{tot} = 6.9 \times 10^{-26}$.

Since this probability is roughly equal to the chance of finding *one* marked penny among a collection in which every inhabitant of half a million planets with population equal to ours each has a billion dollars in pennies, it is clear that Patten's proposal lacks merit! Even assuming that only Venus and Mars have had their orbits disrupted (and Velikovsky certainly assumes more than this), the combined probability that Venus and Mars would have orbital planes as closely aligned with earth's as they do is 2.7×10^{-7}, about one chance in four million. If you knew that someone in Virginia had stolen your wallet, a "random capture" of one of its inhabitants would be about as likely to net the culprit!

In fact, these figures show that any theory for the origin of the solar system must contain a mechanism for producing the planets in nearly co-planar orbits.

A similar problem involves the shape of the planetary orbits. Two objects bound by their gravitational attraction move in ellipses around their common center of mass. For the solar system, this means that each planet moves very nearly in an ellipse about the sun, since the effect of the planets on each other is very small (at least at the present time). The shape of an ellipse is indicated by a quantity called eccentricity, usually represented by the letter e. If e is zero, the ellipse is actually a circle. As e increases from zero toward one, the ellipse becomes more elongated, going to a straight line or parabola as e goes to one. If a planet has been captured randomly or its motion around the sun has been randomly determined by close approaches to other planets, then all values of eccentricity between zero and one should be equally likely.

In fact, the eccentricities of the planets are unusually small, as seen in Table II. The orbits are much more circular than would be expected for random capture or close approaches. This may be seen by calculating the individual and collective probabilities for such small values of e. Assuming that each value of e between zero and one is equally likely, then the probability that e has a value less than or equal to some value x (between zero and one) is just the value x itself.

TABLE II

Planet	Eccentricity (e)	Probability ($=e$)
Mercury	0.206	0.206
Venus	0.007	0.007
Earth	0.017	0.017
Mars	0.093	0.093
Jupiter	0.048	0.048
Saturn	0.056	0.056
Uranus	0.047	0.047
Neptune	0.009	0.009
Pluto	0.249[43]	0.249

Thus, for instance, Mercury has an eccentricity of 0.206. The probability that a planet captured randomly would have an eccentricity less than or equal to 0.206 is just 0.206. The probability for the whole set of nine planets having as circular orbits as they do is again the product of the individual probabilities. i.e., 6.5×10^{-13}, which again is very small. The probability that just Venus, Earth and Mars would be as circular as they are is only 1.1×10^{-5}, again suggesting that the planets have not been randomly captured or greatly disrupted in their orbits.

Although he gives a certain amount of historical credit to the Old Testament narratives, Velikovsky is no believer in supernatural revelation.

In contrast, the comets, which may well have been captured randomly from interstellar space, have much higher eccentricities. The twenty-five short-period comets listed by Motz and Duveen range in eccentricity from 0.132 to 0.967 with an average just over 0.6.[44] This is not a representative sample of the comets either, because most of the comets known have very long periods and eccentricities very close to one.

For the theories of either Velikovsky or Patten to stand up, they need to find some mechanism which circularizes the orbits of (at least) Venus and Mars. No known physical laws will do the job, and the fact that Halley's comet has been observed to return regularly since 240 B.C.[45] indicates that it has suffered little change in eccentricity in the past 2000 years.

Problems of Rotational Mechanics

Now we consider the physical problems involved in stopping the rotation of the earth or drastically tilting its axis of rotation. The physical laws governing the rotation of a rigid object are not as familiar to most people as those controlling the movement of an object from place to place. However, the formulas for rotational motion are really rather similar to those for translational motion except that a number of new quantities are defined. Thus the mass m is replaced by the moment of inertia I, the force F by the torque T, the linear momentum p by the angular momentum L, and the linear velocity v by the angular velocity w. See Table III for a comparison of three basic formulas.

We now calculate what torque would be necessary to stop the earth's rotation in a relatively short time. Assuming a constant torque, we can integrate the last equation in Table III to get $T=(L/t)$. The *Smithsonian Physical Tables* give the mass of the earth as 5.975×10^{27}g., its equatorial radius as 6,378 km,[46] and its moment of intertia as $I = 0.333\ mr^2$,[47] from which we calculate $I = 8.12 \times 10^{44}$g cm^2. The angular velocity of the earth is 7.3×10^{-5} radians/sec,[48] so that we may calculate its angular momentum from the first rotation formula in Table III as $L = 5.93 \times 10^{40}$ g cm^2/sec.

If the reversal of the shadow of the dial of Ahaz (2 Kings 20) is understood as a reversal of the earth's rotation, then the earth must be brought to a stop in just a few minutes. Joshua's long day requires a stop in a fraction of a day (and a drastic tilt involves about the same change in momentum, and therefore the same torque). Using one full day for the time taken to stop the earth, we find a torque of 6.86×10^{35} dyne cm is necessary.

TABLE III

Name	Translation Formula	Rotation Formula
Momentum	$p=mv$	$L=Iw$
Kinetic Energy	$E=\frac{1}{2}mv^2$	$E=\frac{1}{2}Iw^2$
Change in Momentum	$F=dp/dt$	$T=dL/dt$

So far, none of these figures make much of an impression unless one is thoroughly familiar with the quantities involved. But now we consider how this torque might be obtained.

Could the torque have been exerted by the gravitational pull of Venus passing very close to the earth? If we took Venus and the earth as rigid spherical objects, the answer is "no," for gravity would have nothing to "grab" to produce a torque. But the close approach of Venus would raise a tidal bulge on the earth, which we can represent by thinking of the earth as composed of two masses, each equal to $\frac{1}{2}m$, separated by a small distance $2a$. In this case, the planet Venus, with mass M, at a distance R from the earth (where R is much larger than a) would exert a torque on the earth given by

$$T = (G\,M\,m\,a^2/R^3)\sin 2\Theta,$$

where G is the universal constant of gravitation and Θ is the angle between Venus and the earth's bulge. See Figure 2 for the geometry of this situation.

Let us choose the optimum value of 45° for Θ. For T, we use the necessary torque calculated above. For simplicity, we use the earth's mass for both m and M. For a, let us choose the value 100 kilometers (about 60 miles), which would represent about as large a bulge as possible without producing large rips in the earth's crust (the moon only produces a tidal bulge in the solid earth of a few inches). Putting all these quantities in the last formula, we solve for R to see how close Venus must come to produce enough gravitational torque to stop the earth's rotation in one day. The result is R = 7000 km, less than 5000 miles! But this is inside the Roche Limit,[49] which marks the point at which gravity will pull apart a body approaching the earth. Consequently, it appears that the earth and Venus would disintegrate before they could get close enough together to stop the earth's rotation in one day!

Any theory for the origin of the solar system must contain a mechanism for producing the planets in nearly coplanar orbits.

Since magnetism is a stronger force than gravity, Velikovsky seems to be inclined to look in that direction for the necessary torque.[50] The earth already has a magnetic field of its own, so if Venus could somehow apply a strong magnetic field to the earth, it might be able to tilt it or stop its rotation.

The torque T which can be exerted by a magnetic field B on an object having a magnetic moment u (under optimum conditions) is $T = uB$.[51] Using the required torque 6.86 x 10^{35} dyne cm, and the earth's

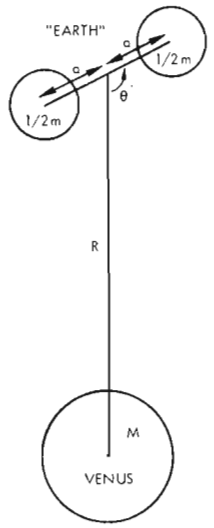

Figure 2. Schematic diagram of the quantities involved and the geometry for the calculation of how close Venus must approach the earth to stop its rotation in one day. The size of a is greatly exaggerated to clarify the picture.

magnetic moment u = 8.06 x 10^{25} cgs units,[52] the magnetic field required is B = 8.53 x 10^9 gauss!

For the sake of comparison, the earth's own magnetic field at the surface is about 0.5 gauss; the strong magnetic fields in sunspots are a few thousand gauss; and the largest sustained magnetic fields produced by man are a few hundred thousand gauss. Thus a field of over 8 billion gauss sustained for a day thousands of miles from its source (Venus) is preposterous. Velikovsky seems to sense the force of this problem, and he tentatively suggests an earth-sized mass of iron filings (!) to do the job.[53] Just how these all get together to form the planet Venus after the job is done is not specified. In any case, one shudders to think what sort of remanent magnetism would have been left in our iron deposits if the earth had ever been subjected to such a strong field!

This does not end Velikovsky's difficulties with rotational mechanics, however. It is easy to show that there is only a miniscule probability that Venus would even pass as close to the earth as 6000 miles (in order to influence its rotation) under the conditions Velikovsky specifies. For according to Velikovsky, Venus had an elliptical orbit from about 1500 B.C. to about 650 B.C., during which time its orbit presumably extended from about Jupiter's orbit inward to about Venus' present orbit. In such a case, Venus would have an orbital period of at least five years, and therefore it would cross the earth's orbit no more than 340 times.

Assuming that Venus' orbit at that time had a tilt of only 1° (smaller than the present tilt of Venus or its "parent" Jupiter), Venus could be as much as 1.7 million miles above or below the earth's orbit when it passed by, of which only the central 12 thousand miles would be close enough to the earth. But Venus must not only come this close to the earth's orbit, the earth must be nearby when it does. Since Venus is moving at least as fast as the earth when it crosses its orbit, the earth moves no more than 12,000 miles while

For the theories of either Velikovsky or Patten to stand up, they need to find some mechanism which circularizes the orbits of Venus and Mars. No known physical laws will do the job.

Venus is within 6,000 miles radially of its orbit. All this means that when Venus crosses earth's orbit, it must pass through a "window" 24,000 miles long and 12,000 miles high to score a "hit"! If this sounds easy, remember that the target area is 3.4 million miles high and 600 million miles long (the circumference of the earth's orbit)!

With 340 shots, the probability of only one hit is just 340 times the ratio of the window or bullseye area to the target area as a whole. The result is $P = 4.8 \times 10^{-5}$, about one chance in twenty thousand. Yet Velikovsky postulates at least one close approach of earth and Venus, another of Venus and Mars, and a third of earth and Mars!

As in the case of orbital mechanics, there are also some historical evidences against any past permanent changes in the axis or rate of the earth's rotation. The Palermo Stone from Egypt's Old Kingdom (thus before the Venus catastrophe which supposedly destroyed the Middle Kingdom) seems to indicate a 365-day year.[54] Unless this evidence can be discounted, Velikovsky would have to postulate compensating changes in the length of both the day and the year to preserve this ratio.

In addition, the pyramids of Cheops and Chephren (also dating from the Old Kingdom) are aligned to present true north within five minutes of arc (1/12 of a degree).[55] On Velikovsky's assumption that the earth has been tilted, there would be no physical way for the earth to "remember" and return to its previous alignment. Of course, it might be claimed that the earth was previously aligned 90° or 180° away from its present orientation, but even so the probability of such an accurate realignment is

$$P = (1/12°)/90° = 9.26 \times 10^{-4},$$

about one chance in a thousand!

Conclusions

Considerations of space have precluded a more thorough examination of orbital and rotational problems associated with Velikovsky's (or Patten's) scheme. It is regretted that most derivations have been left out, but a college-level physics major should be able to reproduce them for himself, and anyone with less training has probably found this paper tedious enough already.

I had intended to devote another section to Venus as a comet, as Velikovsky's thesis has several weak points in this area, but again space forbids. I just observe that Venus' total mass is probably a million times larger than that of any known comet, as is its density,[56] and that a comet tail, being extended by the force of the solar wind, could not possibly transport enough material to supply the earth's petroleum even if it could penetrate the earth's magnetosphere and atmosphere (which is unlikely).

In conclusion it appears that Velikovsky must at least postulate the existence of a number of rather specific unknown physical laws if he is to carry out his thesis. While it is very likely that there are still many physical laws unknown to man, it is extremely unlikely that we have missed any forces lurking in the solar system with the strenth and range necessary to produce the effects Velikovsky must have.

My advice to fellow Bible-believers seeking to understand Joshua's long day, the flood, and other spectacular physical phenomena which have occurred during human history is *not* to quit looking, for very few discoveries are made by people who are not searching for something. But I do suggest that this particular line of investigation—the near collision of planets within the span of human history—is a dead end.[57]

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[25]*WIC*, pp. 69-74.
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[45]Abell, *op. cit.*, pp. 289-90.
[46]W.E. Forsythe, ed., *Smithsonian Physical Tables*, 9th ed. (Washington, D.C.: Smithsonian Institution, 1969), p. 729.
[47]*Ibid.*, p. 739.
[48]*Ibid.*, p. 780.
[49]Motz and Duveen, *op. cit.*, p. 108.

[50]*WIC*, p. 386.
[51]F.W. Sears and M.W. Zemansky, *University Physics*, 4th ed. (Reading, Mass.: Addison-Wesley, 1970), vol. II, p. 441.
[52]Forsythe, *op. cit.*, p. 470.
[53]*WIC*, p. 386.
[54]Jack Finegan, *Handbook of Biblical Chronology* (Princeton, N.J.: Princeton University, 1964), pp. 77-79.
[55]G.S. Payley and N. Abrahamsen, *Science*, vol. 179, pp. 892-93 (1973).
[56]Motz and Duveen, *op. cit.*, p. 235.

I suggest that the near-collision of planets within the span of human history is a dead end as a mechanism for catastrophism.

[57]I would like to thank my brother James I. Newman for his help in preparing the diagrams for this paper.

THE BLACK HOLE OF SPACETIME

When John Archibald Wheeler takes exception to Shakespeare, it is out of his conviction that our fate is indeed inextricably bound up with the stars. Winner of some of the nation's major awards for science, adviser on defense matters to presidents and generals, Wheeler is Joseph Henry Professor of Physics at Princeton. He is currently absorbed in the study of "black holes"—a phrase he has coined to describe the burned-out stars that have undergone gravitational collapse. It is the implications of such gravitational collapse, on an awesomely grander scale, that Wheeler calls "the greatest crisis one knows how to point to in the physics of our time." This is the possibility that the entire universe is destined to undergo a similar collapse, to become itself the ultimate, final "black hole."

Wheeler recently described the phenomenon to Laurence Chase in the relaxed atmosphere of his Princeton study.

Gravitation

Before we begin to grapple with questions about the entire universe, John Wheeler says, we must first understand something of the behavior of stars.

Gravitation, he points out, has to do with the birth of stars because it is through gravitational attraction that hydrogen atoms come together in space, eventually to such densities and pressures that great heat is generated, thermonuclear burning begins, and a star "turns on." Hydrogen is converted into helium, helium into carbon, carbon into heavier elements by a roundabout process. All the atoms in your body have come through such stellar furnaces now long banked; the mysterious process called life has merely rearranged the atoms into molecules, cells, fibers, proteins and so on.

Gravitation also has to do with the death of stars because its relentless contractive force continues after the thermonuclear fires have died. "White dwarf," "neutron star," "pulsar"—all are scientists' names for dead or dying stars. "Black hole" refers to the ultimate annihilation: gravitational collapse to oblivion.

The author of this article is Laurence B. Chase, an administrator at Middlebury College, former science writer in Princeton's Office of Public Information. *This excerpt was prepared by* Intellectual Digest *from the original article which appeared in* University: A Princeton Quarterly (*Number* 53, *Summer* 1972), *Copyright Princeton University* 1972. *Reprinted with permission.*

The Black Hole

What, at first sight, could be more dramatic, more violent, than a black hole? Wheeler asks. In that devastating crunch of gravitational collapse, everything familiar is utterly destroyed. He has written of the process:

> The collapse takes place on a characteristic time scale. For an object with a mass comparable to the mass of the sun this time is less than a millisecond. Let the original object have a hill on it. Then the effective height of this hill decreases to half its value in a characteristic relaxation time also less than a millisecond. Dropping to half value, then to quarter value, then to eighth value, and so on, with each stage lasting less than a millisecond, every geographical feature of the system by the end of a second is erased away to the utmost perfection.
>
> Drop in a meteorite. It makes a momentary disturbance in the geometry. . . . Drop in familiar objects of the greatest variety of sizes and shapes. All details quickly disappear. We end up with an object characterized, so far as we can tell, by mass, charge, and angular momentum, and by nothing more. If we call the resulting entity a "black hole," then we can summarize the perfection of its final state by saying, "A black hole has no peculiarities."

Violence is not the only distinguishing characteristic of a black hole. As Wheeler describes it, and as science writers love to point out, few things seem weirder than a black hole. Under the influence of its gravitational stronghold, strange things happen to time and space and light. Time is said to take on spacelike

characteristics, space some features of time. To the earthling uneducated in relativity theory, nothing seems more natural, for relativity theory is, among other things, a precise expression of the interchangeable relationships between matter and energy, time and space.

At present, Wheeler hastens to point out, the strange and violent black hole exists unequivocally only in some scientists' minds. Two years ago he predicted that 1971 would be the "year of the black hole"—the year in which such an "object" would be found in space. He was mildly disappointed; the year ended without the clear, persuasive evidence that he predicted. Yet scientists did locate a source in the constellation Cygnus, which emits X rays thought to be characteristic of the area around a black hole—its "ergosphere," so named by Wheeler and his colleague, Remo J. Ruffini, because a particle that enters the region picks up energy (*ergon,* in Greek) from the black hole.

Now the search is being intensified and may pay off in 1973, Wheeler says, as scientists learn how to interpret with more confidence those x-ray signals from space. But he warns, "Nothing could be a greater mistake than for physicists to step back satisfied, after the discovery of a black hole."

Collapse of the Universe

To Wheeler, the black hole is merely a distant early warning system for a phenomenon infinitely more violent and strange: gravitational collapse of *the entire universe.* It is that collapse, the *ultimate* collapse, that is never far from his fertile mind. The situation demands superlatives: "I count my work useful only insofar as it sheds light on this mystery, which is certainly the greatest crisis of the physics of our time."

Clearly, there are no greater extremes. This is Wheeler's view of the exact dimensions of the problem: a light year, the commonly used unit of astronomical distance, is just about 6,000,000,000,000 (six trillion) miles. The expanding sphere of space that we call our universe stretches in diameter more than 28 billion light years—about 170,000,000,000,000,000,000,000 miles—across. Ten billion years old, our universe is but a still-growing adolescent. Maturity—according to Wheeler's estimates, which are based on observations made at the Mt. Palomar Observatory in California—will not be reached for another 20 billion years, when the universe's most distant points will be 23 x 10^{22} miles apart.

Then, for a flickering second, the impetus of expansion, imparted 30 billion years earlier by an inconceivably colossal "big bang," will be halted by the forces of gravitation that have been slowly braking the expansion since the beginning. Further expansion will be arrested, and gravitational collapse will begin.

The galaxies farthest from the earth—each a collection of millions of stars—will reverse direction, at first traveling slowly, then eventually approaching the speed of light itself. Fifty billion years from today (give or take a few billion years) our contracting universe will, figuratively, return to the womb.

But here is the crisis: like the black hole, Wheeler explains, the entire universe is predicted by Einstein's equations to arrive at a condition of infinite compaction in a finite time—a "preposterous prediction," because other equally important laws of physics encompassed under the general term "quantum principle" absolutely forbid the conclusions pointed to by Einstein's equations. How, then, to escape this paradox? How get back on the right track? How write a new scenario in which the universe escapes complete collapse, girds against the ultimate violence? At stake is the whole future of physics in our time. Put simply, buried here may be the "glittering central mechanism of the universe," the Rosetta Stone that Wheeler has been seeking for the past 20 years.

Wheeler is attempting to develop a safeguard—a fallout shelter built of theoretical physics—against the final, violent, universal collapse. And in that saving there is a kind of religious grace—sanctification—for man; for the vision he is developing turns out to suggest a universe peculiarly "tuned to man."

Background History

Actually, Wheeler got into the gravitation business in quite a proper scientific manner, not at all as prospective savior. Before and during the early war years, he and a Princeton graduate student, Richard P. Feynman, were trying to understand precisely how charged particles—electrons and protons, for example—interact with one another even over unlimited distances and across total vacuums. Feynman eventually solved that problem by pioneering a new field of physics known as quantum electro-dynamics. When Wheeler finished his weapons work he began to study precisely how *uncharged,* electrically neutral bodies—stars and planets, for example—interact with one another over distances. This was a problem similar to the one he and Feynman had studied, but complicated by the fact that no one had ever observed a gravitational wave. All this got very quickly and very deeply into Einstein's relativity theory, into gravitational collapse of stellar objects, into universal gravitational collapse, then into the paradox. the *crisis:* our universe is predicted to become packed into infinitely small dimensions in a finite time.

"But," says Wheeler, "these predictions *cannot* be right if the quantum principle is true, and we have no reason to doubt the quantum principle. With its *indeterminism,* it gives us a new approach to the crisis of collapse. The problem now—*the* central problem—is to take the two overarching principles of twentieth-century physics, the quantum principle and Einstein's general relativity, and incorporate them into one larger principle, with the ultimate aim of understanding the nature of space and time, matter and energy.

The Two Principles

Wheeler explains these "two overarching principles." "*General relativity*—or, to use a more descriptive word, geometro-dynamics—conceives of space itself as a dynamic entity, changing with time, influencing and being influenced by mass, in the same way that particles and electromagnetic waves are dynamic entities."

> And every dynamic system that we've ever pursued in enough detail has been governed by the *quantum principle,* which says, in brief, that you can *never* predict deterministically—with complete precision—how a system will change in the future, because in order to predict deterministically how a system will change, you have to know two things: what it's doing right now and how fast it's changing. But the quantum principle says you *cannot* know both simultaneously; and we have no reason whatever to believe that there is any exception

for space as a new dynamical feature of nature.

No principle that we know of in all of physics has the same universal power as the quantum principle. The more we pursue it, the more it looks as if it is *the* number one principle, and that everything else is, in some way we don't yet understand, derived from it.

In gravitational collapse of the universe, as in all other areas of physics, he maintains, the principle of indeterminism evidences itself only at subatomic distances. But now we must journey to a world that makes subatomic particles look positively immense by comparison: an incredibly energetic world of "things," each smaller than an electron by 20 powers of ten, each "thing" composed of nothing but—space itself, *pure fluctuating space.*

Quantum Electrodynamics

Citing the fact that gravitation and electromagnetism are both ways by which energy is propagated through space, Wheeler explains how he came upon the level of analysis at which "somethings" are created out of nothing:

To my mind no development in all of physics since World War II has been more impressive than that of quantum electrodynamics. It won Nobel prizes for Feynman, Schwinger, Tomonoga and Lamb. Why, it gave us the idea that the electromagnetic field, which transmits electromagnetic radiation across empty space, is always fluctuating, never quiescent. This fluctuating force, which is additional to the force that an electron feels in its orbit around the nucleus of the atom, has in fact been measured; the electron feels a steady force from the nucleus, but it also feels a tiny fluctuating force that pervades all space. Why did these men suspect that the force was there? Because the quantum principle predicted that the electromagnetic field could *not* be quiescent, for that would violate indeterminism. Now the lesson to be drawn from that discovery, by inference, is that pure space, which transmits gravitational radiation, cannot be quiescent either; it *must* be fluctuating. When examined at small-scale distances, it *has* to be 'jiggle-jaggling' and irregular.

Wheeler suggests an analogy. "From an airplane six miles high, the ocean looks smooth. Down at sea level, in a life raft, however, we see that waves are breaking, and the surface is highly irregular; what's more, instead of its being merely irregular, there are droplets breaking loose. Now space, too, looks smooth at the scale of everyday life, smooth at the scale of atomic structure, and smooth at the scale of nuclear structure. But when one gets down to the scale of distances 20 powers of ten smaller than the scale of nuclear structure, then one predicts that space is foamlike." The 10^{-33} centimeter dimension at which space becomes foamlike—the dimension at which something is created out of nothing—is known to Wheeler's Princeton colleagues as the Planck-Wheeler length, though Wheeler always calls it simply the Planck length.

The Crisis

Here, then, we return to the crisis: What happens to the dynamics of the universe, or of the black hole, when either is compressed to dimensions as small as the Planck-Wheeler length? For in this incredibly tiny world of random fluctuations, John Wheeler says, the future of the universe will be told.

Here the deterministic world of general relativity and its inevitable gravitational collapse, marching on its all-conquering path from the universe to the black hole, at last comes to a domain of distances where collapse loses its terror—where collapse is not only all the time taking place, but is also all the time being undone (fluctuations in space itself, all the time and everywhere). And if collapse at that quantum level of smallness is undone, does this not say that the collapse of the universe itself, when it comes down to this level of distances, is also undone?

Convinced himself that black holes must exist and lend themselves to observation, and working closely with colleagues to discover the many ways a black hole can interact with its surroundings and show itself ("the sight and sound of a black hole"), Wheeler regards the eventual discovery of these objects most of all as an additional prod to get on with a deeper understanding of the world of the very small. What happens to the black hole when it quickly reaches the tiny world of random fluctuations? Where does everything go? Is there a certain probability that the whole thing will expand again? That the particles that lost their identity in collapse will be reborn? And where? "There is no indication in Einstein's standard of relativity that a star with completely different characteristics will eventually emerge from the black hole," he says. "Nor is there any indication that the matter will emerge somewhere else in space. But may it emerge somewhere in another universe?"

Wheeler describes the matter in a black hole as being squeezed through a knothole in space, forced down to the world where fluctuations are everything, there to reemerge according to rules of probability not yet understood. The void of space is the stage on which the drama will unfold, and scientists hope to watch it safely at a distance, from the outside.

Superspace

But how could anyone conceivably observe the collapse of the entire universe? If the universe is everything, no one can stand outside and watch, we are accustomed to think. But if indeterminism governs everything in extreme collapse, there must logically be some entity, some larger stage, sufficiently all-encompassing to contain a variety of *possible* new universes. The physicist explains:

The stage on which the space of the universe moves is certainly not space itself. Nobody can be a stage for himself; he has to have a larger arena in which to move. The arena in which space does its changing is not even the spacetime of Einstein, for spacetime is the history of space changing with time. The arena must be a larger object: *superspace.* Superspace is not endowed with three or four dimensions—it's endowed with an *infinite* number of dimensions. Any single point in superspace represents an entire, three-dimensional world; nearby points represent slightly different three-dimensional worlds.

Wheeler discovered—one might almost say "invented"—superspace in the late 1950s; and the idea that there could be something somehow "out there," beyond the universe and not a part of it, was picked up eagerly by his colleagues. Indeed, the quantum principle demanded it. Wheeler quotes philosopher William James: "Actualities seem to float in a wider sea of possibilities out of which they were chosen; and *somewhere,* indeterminism says, such possibilities exist, and form a part of the truth!" That "somewhere," for the physicist, is superspace.

A Cook's tour of superspace—

To my mind, the dramatic new feature about super-

space is this: the shape of our universe changes with time as the universe expands, reaches a maximum dimension and contracts—and this history appears as a track in superspace. When the universe finally collapses, it comes to a region of superspace that represents an extreme condition, and the classical general relativity of Einstein offers no way to go beyond that point. If you try to solve the problem on a computer, the computer stops. Smoke comes out. But according to the quantum principle, the dynamics should continue. We can well expect that when the universe collapses, there's a certain probability that it will start a new cycle: one that will last not 80 billion years necessarily, but a million years—or 50 billion years. Each of these new dynamic histories of the universe, one can believe, will have its own peculiar number of particles in it and its own unique properties for those particles. Another universe will leave its own track in superspace, one quite different from our own universe.

Akin to Theology?

Ultimately, in the simplicity and strangeness of Wheeler's world, there is something akin to theology, for his vision of the continuous ebb and flow of the universe, each cycle with its own peculiar selection of physical laws and constants, offers, as he puts it with some awe, "a completely different view of the nature of man."

Different, how?

Well, Einstein's general relativity gives us a picture of a universe which starts from indefinitely small dimensions, expands to some maximum size, and some day contracts again to indefinitely small dimensions. This picture gives the impression that the universe is something that is just here by accident. In contrast, the idea that the dynamics goes on in superspace, that the universe makes many cycles, and that in each cycle all the properties are changed—the number of particles, the mass of the particles, the size of the universe, the length of the cycle—this suggests that most cycles of the universe will not permit the development of stars like the sun, of planets like the earth, of the atoms and molecules necessary for life as we know it.

This suggests that there exists a degree of harmony between us and our surroundings that we never realized before. In the past, we looked at our surroundings as if there could be no other, something with which we just had to get along. If this new view is correct, our surroundings are very special and tuned to us, like a plant to its flower: this cycle of the universe like the plant, and we like the flower that comes into a brief bloom and then fades away.

You know, there has been a lot of talk about coal, oil, nuclear power and the sun as sources of energy. But to my mind the most important source of energy is the human being and what he believes. I can't think of anything more important than people's views of how man fits into the scheme of the universe. That's why I think this work we're doing now at Princeton is extremely important.

Galileo and the Church: Tensions with a Message for Today Part IV

T.H. LEITH
Atkinson College
York University
Toronto, Ontario, Canada

The Strategies and Impact of the Copernicans

It is worth asking whether the *Dialogue* contained anything really novel in favour of the Copernican scheme. It did, even if we ignore the first printing of his strange tidal theory mentioned earlier. For one thing it mentions the annual variation in the paths of the sunspots, first reported by Francisco Sizzi, a rather puerile critic of Galileo's early telescopic work, in 1613 and indicating that the equator of solar rotation was inclined to the ecliptic plane. The inclination, of course, causes a change in the angle between the sunspot paths and the ecliptic from season to season, in a yearly cycle, and Galileo noted that the obvious reason was our annual motion about the Sun. It is true that the apparent paths of the spots could be explained in the Tychonic model also, though the Earth is totally stationary within it, but it would require very complex movements of the Sun which Galileo considered quite unlikely.

The other novelty is the *Dialogue's* profound dissimilarity to the great astronomical treatises which pre-

The year of 1973 *has been designated Copernican Year in honor of the* 500*th anniversary of the birth of Copernicus in* 1473. *In keeping with this commemoration, the* Journal ASA *offers a four-part publication of a paper presented by T. H. Leith at the* 1972 *Convention of the American Scientific Affiliation at York University. Part I appeared in* Journal ASA 25, 21-24. *March* 1973; *Part II in* Journal ASA 25, 64-66, *June,* 1973; *and Part III in* Journal ASA 25, 111-113, September 1973.

ceded it. Nowhere does Galileo care to explore the details of the revolutions of the planets or of the Moon and seldom is it mathematical. Apparently he cared as little for kinematic descriptions like Kepler's, even if it were claimed that they were true, as he did for fictional devices. The latter tended, he thought, to perpetuate the dichotomies of the ancient two-level cosmology while the former continued to bind the physics of motion in its terrestrial fetters. Instead, Galileo's ambition was to emphasize the geodynamic aspects of a Copernican world view and to call for the extension into the heavens of the physics which he was actively building on Earth.

Galileo, of course, recognized the coherence provided by Copernicus in placing the planets about the Sun in a specific order, but even this seemed to be merely an esthetic judgment carrying weight only for a mathematician. In its place Galileo wished to offer evidence of the legitimacy of Copernicus' basic insight; evidence of the inability of traditional argument to falsify the motion of the Earth and instead two new physical proofs of its movement: evidence of the similarity of the planets and the Moon to the Earth, and the evidence of similarity of the planetary and lunar motions to those exhibited in terrestrial physics. The alternative which he aimed to falsify was the Aristotelian philosophy of nature. Ptolemaic astronomy was attacked only indirectly because of its Aristotelian facets; its mathematical devices, or modern improvements upon them, were unimportant to Galileo's concerns. In this exercise he prospered, seriously undermining Aristotelian physics here, and in his *Two New Sciences*[17] published later. He was perhaps less successful against Tycho's doctrine. But his arguments unfortunately did little for the kinematic credibility of Copernicanism for they left the Moon and the planets circling the Earth and the Sun at constant angular velocities, just as a ball would circle the center of the Earth endlessly if rolling on a frictionless surface. This was much too simplistic after Kepler's labors. If he criticized others for 'saving the appearances', he could not even do that much himself.

It would seem, when Galileo wrote in *The Assayer* that the universe stands like an open book "but we can understand it only if we begin by learning to comprehend its language and interpret its characters (for) it is written in the language of mathematics and its characters are circles, triangles, and other geometrical shapes" that his agreement with Kepler, who might have said the same thing, was more apparent than real. It might have been repeated too by Galileo's younger contemporary René Descartes with even more disparity of meaning. Certainly it was in the spirit of the many Renaissance figures who read in nature innumerable mathematical analogies, often in defence of traditional cosmology and with whom Galileo could scarcely agree[18]. Even the follower of Ptolemy, arguing that his mathematical devices were capable of being made adequate to prediction and thus should not be matters of contention among astronomers, could have enunciated the same creed. But how varied the implications, how diverse the pre-dispositions, how conflicting the connotations!

Clearly, the meaning of the mathematization of nature in the Renaissance is, if not obscure, complex. It is dangerous simply to label it Platonic or Pythagorean, as is often done, for the adjectives can indicate an *attitude* as well as a *position* or indeed an assortment of modifications of each. Copernicus' position was not that of a Platonist or Pythagorean or he would have agreed that the mathematical patterns of nature must remain hidden from us. Rather, like Tycho, Kepler and Galileo, he believed that nature could be treated in mathematical terms, that we seek out mathematical relations by observation and experiment, and that our knowledge of nature's structure is gained by intensive study of limited areas of experience. Even the rationalist Descartes would say "God could well have arranged things in countless ways, the way which He actually chose . . . may be determined only by observation." But their methods were different: Copernicus and Kepler were willing to find patterns and to suggest novel (and unsatisfactory) physical foundations for them, Tycho was prone to assume much of Aristotle's physics and traditional Biblical exegesis and to work from there, while Galileo and Descartes could overlook details about planetary motions in trying first to move their terrestrial physics into the heavens.

Methodological diversity is an indication of disagreement as to tactics and strategy in resolving a scientific problem. It is often an expression too of dispositional disaccord as when we compare Kepler's, Galileo's, and Descartes' philosophies of nature on a broader level than their consonance regarding a mathematical world. Kepler was mystical, sympathetic with aspects of astrology, and convinced that the cosmos was finite; Galileo was hard-headed, opposed to the occult to the point that he denied the Moon's influence on the tides, and of mechanistic and materialistic bent; and Descartes could offer sincerely many certitudes about the world assumedly based upon reason, reduce matter to space, and found his physics upon the direct activity of God. Their followers, in addition, could disagree vigorously about the implications of these, and like, matters.

So could those seeking a reconciliation of their views with theology. Kepler's astrology would be suspect and, in time, his finite world would be interpreted as discrediting the power and glory of God. Galileo's comment in *The Assayer* that "I don't believe that anything more is necessary to give rise to our tastes, smells, and sounds than that external objects have sizes, shapes, numbers and less or greater speeds" was destined to stir endless controversies about materialism and mechanistic philosophy. Recall, for example, what affinities one can find between these in Newton's apologetics and then remember Leibniz's opprobrium[19]. And Descartes was condemned widely because his physics was difficult to reconcile with transsubstantiation while Jansenists and Calvinists, on the other hand, favored its determinism.

It is critical, then, that we realize that the implications of the Copernican revolution for the church lay not only in its simple challenge to traditional exegesis of a few passages or even to the central place, geometrically if we will, of man and the drama of the fall and redemption. Those may have been clearest at first, as they were to Melanchthon or to Osiander who wrote the notoriously misleading preface to Copernicus' *Revolutions*, but it required the social upheavals and tensions of most of a century to get Rome to follow Melanchthon's advice and to repress what he had called the impudence of its Copernican intellectuals. Even then it required peninsular and Vatican politics of

which we have given no account here, and an apparent frontal attack upon vested authority, to bring it into action. The Church moved when goaded and when it recognized just who Galileo was making the final arbiter on hermeneutical rules whenever science was involved, and when they saw that this implied giving to a novel astronomy and physics the power to break down the harmonious world of tradition[20].

How little though the Church, or Galileo for that matter, could see the many other consequences of the revolution, for it continues to our day. By complex and intertwining paths it led to Newton's and Laplace's physics and on to Einstein, to deism and then agnosticism, to new cosmologies, to Descartes and Locke and on through Hume and Kant and Spinoza to contemporary philosophy, and to a thorough revision of man's view of himself exhibited by a modern theological conservative as well as by a Marxist or a Bertrand Russell[21]. We are, of course, not arguing that a Copernican system was the sole or even a conscious source of these developments; we are saying that the scheme, its developing physical base, and the philosophies in which these were initially applied carried diverse and startling implications. No suppressions of the next centuries after Galileo could contain them; an increasingly pluralistic society or complex of societies never can.

This is the case with all novel scientific ideas. They cannot be restrained if the human mind is to be permitted a measure of curiosity and if its suggestions about the world are to be put to test. The contemporary church as a society, is surely obliged to accept this just as it must if its conception of a naturel revelation of God is to be taken seriously. But the thinkers who enunciate ideas in their initial or developing forms, or who use them, do so within varied philosophical attitudes and use the ideas as well in constructing at least partially novel world views. Dialogue on philosophical issues and a person's private beliefs are even more difficult to constrain, as the prohibitions of the Holy Office on Copernicanism, the Nazis, the Stalin years, and denominational history have reminded us sharply. With that fact too the organized Church must come to terms in our time.

Perhaps the warning by Galileo should be recalled here: permit tradition and authority in ecclesiastical matters to overrule empirical data and scientific expertise, and one may ruin and subvert an institution. Ideas, observation and experimentation exist in free places and with free persons, and they eventually erode and invade, discrediting the authority which attempted to proscribe them. The other side of the coin however, recognized by Melanchthon and the Holy Office[22] was that scientific discoveries involve questioning and upheaval equally capable of destroying traditions and authority which is now taken to be illegitimate. The Church's obligation to foster new insights and to recognize the breadth of revelation should help to preserve it from Galileo's prophecy; how it handles the implications of these, and the philosophies attendant upon them, will govern how satisfactorily it survives the impact foreseen by the Lutheran scholar and Roman officialdom.

What the Church Must Offer Science

Let us look, in conclusion, at the opportunities afforded the Church in the light of these considerations, for we should see matters positively. It is no longer sufficient to rest quietly, like the Holy Office in 1633, in the belief that novel scientific ideas seem at first glance to be philosophically absurd and/or formally heretical. Too often we have heard that some theory is imperfectly evidenced and that the Church need not treat it seriously. It may be so, but when a theory is corroborated extensively by severe testing and it gains wide recognition, this attitude is no longer acceptable. Too frequently we react to the unfamiliar as if it were preposterous, though there is often no easy resolution to such a psychology except time. Likewise, too commonly our mind-set on matters exegetical or theological works to confuse heresy with the unusual.

Let us look first at exegesis. Copernicus, Kepler, Thomas Campanella in his *Apologia pro Galileo* of 1622[23], and Galileo all recognized that hermeneutics is, more than was admitted, a human art influenced by the worldview of the scholar. This we too must understand, however high is the exegete's Scriptural view. If we do, we must expect the Biblical scholar to give more serious attention to the likelihood that many passages are pre-scientific or non-scientific than he often has, interpreting them instead in the light of an antiquated conception of nature. Here the scientist is obliged to inform him of his anachronisms so that he may be more perceptive. We should fully expect that the process will be attended by theological revisions as well. Perhaps this sounds gratuitous or even supercilious but it is the lesson of Church history that the process works, in part, that way. If it is learned, the Church may then offer to thinking men considerable *a priori* flexibility within which new discoveries may be accommodated. No longer need it appear to be in continual and reluctant reaction. Had the church exhibited theological and exegetical room for the scientist and philosopher to move in the past, the ranks of both camps might contain rather more members with respect for Biblical authority than is the case.

Of course, it may be remarked that many Biblical interpreters and many Church bodies permit room for most, if not all, philosophies and interpretations of scientific ideas. Clearly this overly-broad accommodation can be only because of a lower view of the authority of Scripture than is warranted by the evidence. It is the consequence of critical studies based upon certain philosophies about science and certain construals of scientific theories which deny a supernatural view of the world and result in a debased view of inspiration. It is not the product of scientific theories, at least well-founded ones, but of fundamentally humanistic and naturalistic predispositions. Nor is it the necessary consequence of the process espoused above. There we speak of recognizing the intent of Scripture in its own terms and of a Biblical theology prepared to deal with matters which scientific evidences may well soon place before us.

It brings us though to a second point. Scientific theories, while still highly tentative, are often accepted or rejected by many upon matters such as prejudices for or against past ideas, one's world-view, esthetic tastes, or trepidation about or wishful ambitions for their moral or philosophical consequences. Indeed, these matters play a part in developing the theories in the first place. These factors are as unavoidable as they are subjective. Certainly the Church has no obligation toward such theories except to foster the freedoms necessary to test them out carefully, and if it firm-

ly believes that natural and special revelation cannot fail to be in harmony, to expect no irremediable difficulties in synthesis. It does, though, have obligations to determine its stance toward the practical applications of theories operative at any time or likely to be put into effect in the foreseeable future. Biology and biochemistry afford current instances of this necessity. The questions are ones of individual and social morality and on these the Church must speak. If it does, coherently and intelligently, it has the opportunity to recover an influence lost by its past failings in this respect.

This brings us to the last opportunity to be mentioned here: the chance to suport the development of Christian philosophies of man, the world, and action. The Scriptures and scientific knowledge leave extensive room for speculation about the nature of creation and providence or the meanings of history; for interpreting the arts, literature, or science; and for constructing political, psychological, or social models. We mention but examples. In a world filled with philosophies based upon humanistic premises, the Church has offered too little in the way of systems built upon theistic and Biblical premises or, when it has, they have paid inadequate attention to current knowledge and situations. True, the church has seen its philosophers in open disagreement in the past and it has observed disturbing implications being drawn from positions which it thought were sound. Perhaps this is one reason why it has failed to offer the sort of support it should to new ventures and why it has too often satisfied itself with traditional and simplistic treatments of the many matters attracting concern and interest in the society around it and in its own communion. They are insufficient reasons; men are fallible and their schemes imperfect, tensions must exist when theological emphases and the matters which interest thinkers differ, but problems and opportunities must still be faced. Only one illustration is offered.

We live in an age in which science and its offspring technology have revised, in a way few foresaw a quarter century ago, the conditions of our lives. It is apparent that our ability to master the forces of nature around us is immense and increasing. It is clear that we have in our hands the awesome power to create, with rapidity and in profusion, new and little-understood social possibilities. But science and technology have also altered the manner in which we look at ourselves and they have destroyed some of our values while creating others. Here lies their potential for both good and evil, for the process continues.

Yet, in the face of this, the choices to be made among the many alternatives offered is becoming increasingly complex. Surely the Church must give guidance here, examining with knowledgeable persons the purposes and effects and values of the options chosen, criticizing continually, and presenting constructive advice for the future. In the past the institution appeared relevant to man in a context where he knew much less than he does now and held a much diminished mastery over the forbidding forces of nature. Its relevance to the future must be to men who know their powers and appreciate the possibilities within their grasp. Were Galileo with us he could state no greater challenge; he uttered it three and a half centuries ago and some listened and some did not. Conditions then made their deafness serious. Failure to hear today is unthinkable.

REFERENCES

[17] *Dialogues Concerning Two New Sciences,* New York, n.d..

[18] "The Numerological Approach to Cosmic Order in the English Renaissance", *Isis,* December 1958, pp. 391-397 by C.A. Patrides is of interest here. The importance of the number seven seemed more suited to a geocentric cosmos with seven bodies circling it than to a Sun orbited by 6 satellites. Including the central body, on the other hand, could have made the heliocentric view more suitable than its alternative. Numerology is clearly highly selective in its evidence and subject to endless adjustment to fit any predilection.

[19] See *Leibniz-Clarke Correspondence,* H.G. Alexander (ed.) Manchester, 1965 and *A History of Philosophy* (Volumes on Hobbes to Paley, Berkeley to Hume, Descartes to Leibniz, and Hume). F. Copleston, Garden City, N.Y., 1963 and 1964.

[20] Conveniently ignoring the degree to which its own cosmology had accepted much of Aristotle and observational evidences which eliminated things like the flat earth, the tabernacle-shaped world, and the sub-lunar firmanent of earlier traditions.

[21] *The Scientific Revolution,* V. L. Bullough (ed.) New York, 1970; *The Scientific Revolution of the Seventeenth Century,* R. Briggs, New York, 1969; *The Elizabethan World Picture,* E.M. Tillyard, London, 1958. Then see *Science and Imagination,* M. Nicholson, Ithaca, 1966; *The Breaking of the Circle,* M. Nicholson, New York, 1960; *Atomism in England from Hariot to Newton,* R.H. Kargon, Oxford, 1966; *All Coherence Gone,* V.I. Harris, Chicago, 1949; *Seventeenth Century Science and the Arts,* H.H. Rhys (ed.), Princeton, 1961; and *Science and Religion in Seventeenth Century England,* R.S. Westfall, New Haven, 1958. All deal only with the beginnings of the process.

[22] Oddly enough the Spanish Inquisition was less concerned. See *The Spanish Inquisition,* H. Kamen, New York, 1965, pp. 101-2, 293-296. Compare also "Scepticism, Theology, and the Scientific Revolution in the Seventeenth Century" R.H. Popkin in *Problems in the Philosophy of Science,* I. Lakatos and A. Musgrave (eds.) Amsterdam, 1968, pp. 1-39.

[23] A flawed translation by G. McColley is available in the *Smith College Studies in History* for 1936-1937. It is criticized in part by Rosen (see Note 14).

In human psychology, psychiatry and psychoanalysis the attitude of the observer and the motives which lie behind the questions he asks are just as important in determining the results as is the mind of the human being observed. . . . The interaction between the two is a unique unrepeatable event. . .. The intellectual basis for what the scientist says of man is no stronger than that for what the theologian says. By means of a gigantic confidence trick, by pretending that the study of man is science, by hanging on to the coat tails of solid, successful, reliable physics and engineering, an army of atheists and agnostics has forced many theologians to turn and flee.

D. F. Horrobin
Science is God, Medical and Technical Publishing Co. (1970). Quoted from R. F. R. Gardner, *Abortion: the Personal Dilemma,* Eerdmans (1972, pp. 233, 234

BOOK  REVIEWS

THE EXODUS PROBLEM AND ITS RAMIFICATIONS by Donovan A. Courville, Crest-Challenge Books, P.O. Box 993, Loma Linda, California. 1971. 2 vols. 687 pp. Paperback. $9.95.

The study of antiquity involves highly developed disciplines which should never have to suffer the audacious and ludicrous intrusions of learned laymen or dilettantes. Each area within the general fields of ancient Near Eastern history and prehistory is the preserve and responsibility of specialists: meticulous archaeologists, scholars who through lifelong dedication have attained expertise in certain quarters, and philologists possessing a knowledge of particular scripts and languages as well as a thorough familiarity with the corpus of inscriptions and literature. Likewise, any investigation into the ancient world should incorporate all the available evidence—including the Bible. Arbitrary dismissal of the historical framework and chronology provided in Scripture is not indicative of rational historiography. Specialization, advanced degrees, membership in esoteric societies and extensive bibliography are largely wasted if during the course of research the foundational evidence in the Bible is ignored.

Professionals have consistently refused to consider the Biblical Deluge, seven years famine, Exodus and God's influence on the course of history. Pitifully few historians and archaeologists have attempted to honestly compare the Biblical record with the chronology and events of the ancient Near East as they actually happened. Few have even approached the Von Rankian ideal of history, *"wie es eigentlich gewesen"*. Thus, the unfortunate result has been, as Voltaire noted long ago, that history is a lie foisted off on the living by the dead.

Dr. Courville, a chemist by training, has attempted to reconstruct ancient history as it actually occurred by utilizing the Bible and by analysis of traditionally accepted historical explanations. Some may conclude that Courville's recent two volume treatment of these issues entitled *The Exodus Problem and its Ramifications* is irrelevant and unworthy of examination for the reason that his background is incongruous. Admittedly, the results originating from most non-professionals must be taken *cum grano salis*. It is not surprising that a chemist should overlook some techniques of historical method and lack the detailed and ever increasing body of information accumulating in numerous journals and monographs. Nevertheless, Courville has recognized the *key* to the past of the ancient Near East. Where specialists and pseudo-Christian scholars have utterly failed through lack of honesty and ignorance, the author has contributed a remarkably significant proof of the inspiration of Scripture. He has demonstrated that it is time for non-believing "authorities" and those who merely maintain a shabby pretense of belief in the historicity of the Bible to acknowledge the facts. The deformed monstrosity of currently accepted ancient history is totally irreconcilable with the Old Testament. Inspired history within the Bible dictates a complete revision of antiquity to conform with actual events.

It is interesting to note that two men working quite independently and without knowledge of the other reached the same basic conclusions which unlock the seemingly unsolvable contradictions between Scripture and history. More than fifteen years ago Dr. Herman L. Hoeh, in his *Compendium of World History*, properly restored ancient history. Marked differences separate the interpretations of Hoeh and Courville. Yet, the general framework which has been established as a challenge to present academic opinion is the same.

The key becomes obvious when it is realized that a valid reconstruction of Near Eastern history demands:

1. Possession of an accurate chronology.
2. Correct placement of Israelite history with regard to archaeological remains.
3. The establishment of the right parallel progression of events for the areas of Egypt, Mesopotamia, Anatolia and Greece.

Courville begins with a rehearsal of the Exodus story and all the miraculous circumstances which attended it. By the addition of the scriptural 480 years to Thiele's date for the fourth year of Solomon's reign (I Kings 6:1), a date in the mid-fifteenth century B.C. is assigned to the departure of Israel out of Egypt. Accepted chronological schemes of Egyptian history with this date prove to be abortive. No correspondence between Scripture and history is demonstrable during the Eighteenth, or for that matter, with the Nineteenth Dynasty.

As Courville suggests, during Dynasty XVIII there are no evidences for: the plagues, a Pharaonic court in the north, building program in the delta, a Pharaoh whose life was lost at the Red Sea and the collapse of Egypt. Quite the opposite has been discovered in this dynasty which marked the apogee of Egyptian imperialist power. Identification of the Exodus during Dynasty XIX also creates more difficulties than it solves. Which Pharaoh fell along with his 600 chariots? How is the *Merneptah stela* (which mentions the captivity of the nation of Israel) to be reconciled with this late chronological placement? Indeed, how is the period of the Judges to fit in at all?

Analysis of the archaeology directed Courville, Hoeh and others to the fact that Israel entered the Promised Land at the close of Early Bronze III or the transitional period beween Early and Middle Bronze. Widespread destruction of Canaanite population centers, especially Jericho and Ai, occurred at this time.

(*continued on page* 160)

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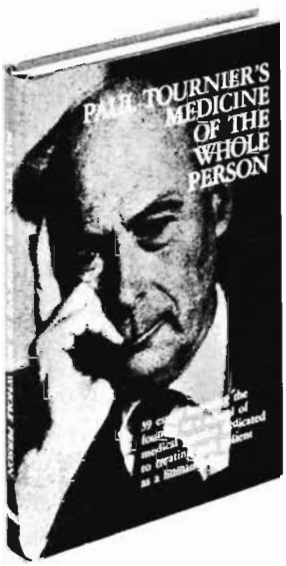

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All acknowledge the parallelism between the end of the Old Kingdom (specifically Dynasty VI) and the end of Early Bronze III. It is at this juncture in Egyptian affairs that Courville rediscovered that the Exodus happened.

The contemporaneity of the Exodus with the end of Early Bronze III and the end of the Old Kingdom has chronological ramifications which alter to a considerable degree the historic structure of the ancient world. Locating the Exodus in the fifteenth century B.C. gives chronological orientation to Early Bronze and the Old Kingdom. Courville brings the beginnings of Early Bronze and Dynasty I down to the post-Flood era towards the end of the third millennium B.C. This development confronts us with the realization that the accepted Manethonian dynastic scheme, of placing one dynasty after another while not admitting the existence of contemporary dynasties, is fallacious. Within the framework of Biblical chronology Courville concludes that the Old and Middle Kingdoms of Egypt were roughly equivalent in time—that this period was brought to climax and swift collapse with the intervention of God in the Exodus. These discoveries also made known the fact that Dynasty VIII and the Second Intermediate periods were contemporary in Egypt and mirrored the ruinous conditions following the Exodus as the Hyksos invaders filled the void left by the departed children of Israel. Velikovsky over two decades ago drew similar conclusions regarding the Second Intermediate. It has been recognized that the Papyrus Ipuwer is the Egyptian version of what happened.

Now the relatively quiet Judges episode, free from Egyptian interference, makes sense when paralleled with the Hyksos rule on the Nile. Likewise, having the revival of Egypt with the New Kingdom at the same time as the Monarchy in Israel provides new meaning to the Near East.

Beyond this basic, but vitally important, scheme Courville and Hoeh have developed very different reconstructions. Having a familiarity with Dr. Hoeh's work, the reviewer is unable to agree with many of Courville's interpretations. *The Exodus Problem,* however, contains many interesting and significant chapters, in accordance with valid chronology, on the archaeological restoration of Palestine. There are concepts presented in these volumes which do not appear in other treatises. Courville has detailed a revision of Mesopotamian, Anatolian and Grecian antiquities which deserves the attention and scrutiny of all those concerned with the literal historocity of the Bible.

Reviewed by Ronald D. Long, M.A. (UCLA), Fontana, California.

A Second Review of *The Exodus Problem and Its Ramifications*

This work of nearly 700 pages is an extraordinary study of wide research and detailed analysis, motivated by a sincere desire to establish the accuracy of Scriptures. It is unfortunately misguided by an altogether defective historical perspective.

Courville taught at Pacific Union College from 1935 to 1949, and at Loma Linda University from 1949 to 1970.[1] Though his major field has been bio-chemistry and his major publication a work on poisonous marine animals, Courville has had a keen interest in archaeology and has pursued a study of biblical chronology for 15 years.

The author's reading has been extensive but indiscriminating. On the one hand, Courville cites completely outdated works, and on the other hand, ignores more recent studies. His study combines an almost stupefying list of names, dates, and other details together with dumfounding dislocations of chronologies, ranging up to six centuries.

While his intention is laudable, his methodology is deplorable. Faced with apparent contradictions between the Scriptures and current archaeological interpretations, the author's solution is a drastic revision that turns chronological tables topsy-turvy. He blithely shuffles the dynasties of Egypt like a deck of cards. He dispenses with the Middle Kingdom of Egypt as a "creation of modern historians" (I, p. 101). On a chart (I, p. 104) Courville lowers the beginning of Dynasty I by a millennium, and places Dynasty XII before Dynasty VI. Courville accepts the date of 1445 B.C. as the date of the Exodus, but suggests that the pharaoh of the Exodus was an obscure Koncharis, whom he identifies with a Ka-ankh-ra of the XIIIth Dynasty (ordinarily dated to the 18th cent. B.C.!).

The date of the Exodus is a problem which is linked with the date of the Conquest of Canaan some 40 years later. Two dates have been proposed: an early date *c.* 1440 B.C. and a later date *c.* 1270 B.C.[2] The later date is accepted by most scholars today, except for American evangelical scholars who have defended the early date primarily on the basis of I Kings 6:1, which gives the chronological datum that Solomon began to build the temple 480 years after the Exodus.[3]

The most atrractive solution to the apparent contradiction between the datum of I Kings 6:1 and the archaeological evidence, which favors the late date, has been made by the British evangelical, Kenneth Kitchen, an Egyptologist at the University of Liverpool. He suggests that the 480 years represent not simple elapsed time, but as in the case of some Egyptian records, the total of some years which may have been partly concurrent. The Turin Papyrus, for example, lists Dynasties XIII to XVII, whose total reigns amount to 450 years; but these pharaohs must have reigned partly concurrently within a 216-year period.[4]

Courville in reckless fashion displaces the Hyksos from the period of 1700 to 1570 B.C. to a period after the Exodus, and further identifies the Hyksos with the Amalekites (I, pp. 101, 229-32).[5] He also lowers the incursion of the Sea Peoples from 1200 to 700 B.C. The father-in-law of Solomon is identified as Thutmose I, who has been transposed by the author from the 16th to the 10th cent. B.C.

A long discussion (I, pp. 258-72) is devoted to denying the well-attested identification of the biblical Shishak with the Libyan Sheshonk.[6] The author accepts the suggestion by Velikovsky that the biblical Shishak is Thutmose III (I, p. 259). He characterizes the Egyptian inscriptions of Sheshonk as vague and is unaware that a monumental stele of Sheshonk at Megiddo confirms the account of his campaign.[7]

Courville is no less bold in making forays to adjust Greek chronology (II, ch. xvi), lowering the fall of Troy from *c.* 1200 to the 8th cent. B.C.[8] He likewise lowers the date of Hammurabi from the 18th cent. to

the 15th cent. B.C. (II, p. 300), and the Amarna letters from the mid 14th cent. to the mid 9th cent. B.C. (II, p. 320). A section on Kassite chronology (II, pp. 306-17) betrays no understanding of the problems involved or acquaintance with recent studies.[9]

In sum, Courville's work is noble in intent, and his labors are laudable, but his theories and findings are, sad to say, "loco" in toto.

FOOTNOTES

[1]The author, apparently a Seventh-Day Adventist graduate of Andrews University, did not benefit from either the works or the counsel of Siegfried Horn of Andrews University, a distinguished Egyptologist and archaeologist. It might be noted that the outstanding work on biblical chronology was written by another SDA scholar, E.R. Thiele, *The Mysterious Numbers of the Hebrew Kings* (Grand Rapids: Wm. B. Eerdmans, rev. ed. 1965).

[2]For a more detailed discussion of the issue, see E. Yamauchi, *The Stones and the Scriptures* (Philadelphia: J. B. Lippincott, 1972), pp. 48 ff.

[3]For studies defending the early date, see: Leon Wood, "Date of the Exodus," in J. B. Payne, ed., *New Perspectives on the Old Testament* (Waco: Word Books, 1970), pp. 66-87; B. Waltke, "Palestinian Artifactual Evidence Supporting the Early Date of the Exodus," *Bibliotheca Sacra*, CXXIX (1972), 33-47.

[4]K. Kitchen, "Chronology of the Old Testament," in *The New Bible Dictionary*, ed. J. D. Douglas (Grand Rapids: Wm. B. Eerdmans, 1962), pp. 214-16; *idem*, "Some New Light on the Asiatic Wars of Ramesses II," *Journal of Egyptian Archaeology*, L (1964), 47-70; *idem*, *Ancient Orient and Old Testament* (Chicago: Inter-Varsity Press, 1966), pp. 72-75.

[5]On the Hyksos, see J. van Seters. *The Hyksos* (New Haven: Yale University Press, 1966); D. Redford, "The Hyksos Invasion in History and Tradition," *Orientalia*, XXXIX (1970), 1-51.

[6]The sources cited by the author in his discussion include such antiquated works as G. Rawlinson, *Ancient Monarchies* (1897), and F. Petrie, *A History of Egypt* (1912)!

[7]Cf. B. Maisler, "The Campaign of Pharaoh Shishak to Palestine," *Vetus Testamentum Supplement*, IV (1957), 57-66.

[8]There is indeed an anachronism in Virgil's *Aeneid* in associating Aeneas who flees from Troy with Dido-Elissa, who founded Carthage *c.* 800 B.C. But it is nonsense to make this the basis of lowering the date of the fall of Troy.

[9]F. el-Wailly, "Synopsis of Royal Sources of the Kassite Period," *Sumer*, X (1954), 43-54; A. Goetze, "The Kassites and Near Eastern Chronology," *Journal of Cuneiform Studies*, XVIII (1964), 97-101; J. Brinkman, "Notes on Mesopotamian History in the Thirteenth Century," *"Bibliotheca Orientalis*, XXVII (1970), 301-14.

Reviewed by Edwin Yamauchi, Department of History, Miami University, Oxford, Ohio 45056.

THE CREATION OF LIFE: *A Cybernetic Approach to Evolution* by A. E. Wilder Smith, Harold Shaw: Wheaton, 1970. 269 pp. $5.95

My normal gestation period for a *Journal ASA* review is about 9 months, apparently followed by a similiar period of travail before publication. *The Creation of Life* fascinated me sufficiently that the first time has been cut to less than 21 days. It is a pleasure to read a book on origins that doesn't quote *The Genesis Flood* (which I admire) even once!

The first half of the book is mainly an attack on *Biochemical Predestination* by Kenyon and Steinman (McGraw-Hill 1969). As the title suggests, this is one attempt (there are others) to advance the argument that the properties of matter are such that the formation of life as we know it is "predestined" given sufficient time. Note that this is not the same as the usual materialist reliance on chance. In fact, as Wilder Smith points out, Kenyon and Steinman are really saying that matter is pre-programmed to form life, although they just assume this, without mentioning how the programming was done or who did it.

Wilder Smith invokes information theory to argue that no complex programming process, whether predestined or not, can exist without a non-random energy supply, monitored by intelligence at some level or other. This is true no matter whether we are considering present-day programming, or some primeval predestination process. His argument is irrefutable, as far as I can see.

The second half deals with artificial intelligence, and basically leads to a related conclusion—not only can coding not exist without intelligence, but the generation of intelligence requires pre-existing intelligence. The evidence includes the failure of randomly generated programming to produce anything useful.

The Creation of Life is annoying in some respects. Wilder Smith fills it with italics. He fills space by quoting from the same identical passage more then once in the same chapter, but on the other hand saves it by referring to his *The Drug Users* for a good part of his evidence and argument in the second part. He feels it necessary to allude to *The Drug Users* and other sources for alleged proof of telepathy, which is not really necessary to his argument.

I would have liked a more rigorous approach in part 1. There is a lonesome $\triangle$ F on p. 60, and the equation "1 nit *[sic]* of information = 1.37×10^{-16} erg/°C" on page 243, but no other equations or estimates of energy requirements between.

In summary, Wilder Smith leaves the attack on blind chance as a source of evolutionary raw material to others and concentrates on showing that an appeal to some magical predetermined properties of matter will not hold water either, unless you are willing to accept a Creator. He is in over his head in spots, but the book is valuable nonetheless.

Reviewed by Martin LaBar, Chairman, Science Division, Central Wesleyan College, Central S. C. 29630

SCIENCE TEACHING: A CHRISTIAN APPROACH by Robert J. Ream, Presbyterian and Reformed Publishing Co. 1972. Paperback. 130 pp. $2.50.

Science is a body of human descriptions and explanations of the world, at no stage infallible or final, except where the foundational framework reflects the truth of Scripture. Scripture is foundational for science not only because of the debilitating effect of sin on human reasoning but also due to the way in which the Creator made the mind of man. Since our thinking is presuppositionally based, no one is exempt from faith in foundational postulates. Human thinking is totally dependent on the Creator's written revelation as a foundation necessary to the proper understanding of all reality, for only in the Bible can be found the universal preconceptions necessary for sound thinking, because only there is knowledge from the omniscient Creator of the cosmos which man is seeking to investigate and to know. The real truth of reality is impossible to obtain without the Bible behind and beneath our thinking; there is no non-Christian truth. Non-Chris-

tian science has inconsistently and unconsciously rested itself in a Christian foundation in order to obtain credence and success.

The Christian who knows providence and preservation to be a fact knows that such a thing as chance simply does not exist. The Biblical view of reality precludes random, purposeless activity anywhere in the universe. Science is not possible in a system of ultimate chance and absolutely random-natured reality but depends on a law-structured creation, regulated by the Creator. Chance as a totally uncaused or undirected event is alien to a scriptural view of reality. Scientific explanation is not a final explanation at all but rather an abstract and, therefore, a limited description lacking in the personal dimensions which are not lost but emphasized in Scripture's more broadly inclusive viewpoint. The Word of God stands in a most obvious antithetical relationship to the tendency to see any part of creation whatsoever, laws included, in any measure independent or self-existent. Could we see the whole of created reality from God's standpoint, there would be no chance, no disorder, only concord, only a vast but harmonious pattern. Since man is finite and cannot see that final plan in all of its details, there is to us that which appears to be truly unpatterned and out of order. Scripture and the world must harmonize; the difficulty lies in the area of interpretation which is not infallible because of the distorting effect of sin on human thinking.

The concept of law or regularity, an absolutely necessary preobservational and preexperimental condition for science, is necessarily grounded on a religio-philosophical foundation. Thus as a technical methodology, the scientific method derives from, is inseparably connected to, and is always resting on a religious view of life. Science is not free from religion and philosophy; it can only ignore the religious and philosophical foundations on which it stands. The Bible's purpose is not to stifle scientific investigation by preventing inspired models but to restore that view of the world and life, lost by sin, which is absolutely fundamental for any true and successful search for models. The intangible and spiritual aspect of man cannot be adequately known apart from the Biblical conception of man, sin and redemption. Though the Bible displays "common models" (which may be illustrations of relationships rather than testable concepts of relationships) and though the external form of such a model remains a fixed part of the inspired and therefore standard text, it is the deeper meaning of the model (that which can be translated into other terms without loss) that is authoritatively binding.

These comments, largely quoted from *Science Teaching: A Christian Approach,* are provided to illustrate Ream's scripturally based approach to science. The author's reformed view of the Bible may not be acceptable to some, particularly those choosing to believe in evolution for man's origins. I feel the book has much to offer to any Christian in the field of science, particularly to anyone teaching in an evangelical institution. In addition to developing a non-technical Christian philosophy of science, although the development is brief and could well be expanded, Ream attempts to show how it may be implemented in the classroom with many practical suggestions. Typical of these are: If the glory of God is the goal of science, the teacher will do little to advance this or transmit it if it is absent from his own approach and procedure. The greater one's commitment to Christ, the greater his sense of stewardship and interest in that which Christ calls him to do. The Christian teacher ought to know well the basis for and the limitations of the empirical aspect of knowledge acquisition in the physical sciences. By strategic reference to equally real and important emotional, aesthetical, ethical and theological realizations, the teacher can endeavor to compensate for the predominantly empirical nature of his students' scientific activities. Thus he can reduce the overwhelming force of empiricism's dominance in contemporary science. No teacher can lead his students where he himself has not first been. The teacher will have to know those universal truths of Scripture that form the necessary foundation on which his particular science rests. Discussion of scientific laws should always proceed on the foundation of the works of creation and providence. If the position of the teacher in respect to science is wholesome, properly balanced and Christ-oriented, and if his personal life exhibits Christ as preeminent in all things, he will not be able to hide such attitudes either in the classroom or the laboratory. The way the teacher views the world, to a high probability, is the way the student will view the world.

Reviewed by Bernard Piersma, Dept. of Chemistry, Houghton College, Houghton, N.Y.

INQUIRY INTO SCIENCE: *Its Domain and Limits*
by Richard Schlegel, Doubleday Anchor, Garden City, New York (1972) 108 pages. Paperback. $1.45

This book is volume number 66 in the Doubleday Anchor Book Science Study Series. The first volume was published in 1959 and the latest issue is volume 71. The primary purpose of the series is to provide a survey within the intellectual grasp of the young student or the layman to encourage his own investigations into natural science. The author of this book is Professor of Physics at Michigan State University with teaching interest and experience in the philosophy of science as well. To a high degree it is a useful and instructive summary of the limitations of science written by a scientist.

The author proceeds from a discussion of the structure of science to show how limitations are imposed by the logic of science, the content of science, and pragmatic factors. Finally he considers the relationships between natural science and the arts, literature, philosophy, and theology, which he considers to be of equal significance for the life of the whole man. It is not part of his intention to pursue the social implications of applied science nor its inherent ambivalence.

He points out that "we are not justified in thinking that a given theory gives us the only way of talking about the aspect of nature to which it is relevant," and to think that the "primitive constructs (of an established theory) are 'as given in nature' . . . is illusory." He is cautious about drawing conclusions about free will from the Indeterminacy Principle of physics, but goes as far as to say that "it does indeed seem valid to say that this indeterminism on the micro-level severely weakens the case of those who assert that there can be no freedom of the will."

He is humble about present day physical knowledge and admits,

> The natural processes of biological systems, for example, including those of highly complex nervous systems, might well involve modes of energy and interaction that are not within the ken of present-day science. However, such entities would not be parts of hypothetical other worlds but rather subjects for ordinary scientific investigation.

He thus makes the significant point that the observation of strange phenomena is not per se a validation of the philosophical or religious system in which these phenomena are expounded and interpreted.

He argues that most scientists are unwilling to accept the notion of the creation of the universe a relatively short time ago, but will be attracted by the presuppositions of their discipline to the model of a finite universe undergoing an oscillating expansion and contraction. He rejects reductionism and argues

> in the organization of the highly complex structures of living organisms, new natural properties should appear, properties which cannot be reduced to those present among non-animate systems of atoms or molecules.

Likewise he rejects "the explanatory power of science" as the "complete philosophy of the natural world."

Unfortunately the depth of the author's own philosophy beyond science does not exceed that of humanism. In a single reference to the great effect of Jesus of Nazareth, he continues in the same paragraph to give other "like" illustrations as Harriet Beecher Stowe and her *Uncle Tom's Cabin*. He also believes that "the development of science has undermined the world outlook that was associated with Christian belief, and in many ways made the belief a less tenable one." He therefore hopes for "a more adequate religion" through the utilization of "art and science as parallel efforts toward understanding."

> It is attractive to think of a complete philosophy that has the relevance and immediate appeal of a religion as well as the firmness and power of natural science.

It is regrettable that the author's knowledge of the realities of the Christian faith fall so short of his understanding of the limitations of science. Still the book may well prove useful as a guide to understanding the nature of science for one who would be immediately turned off by a clear Christian approach to the question.

BEYOND SCIENCE by Denis Alexander, A.J. Holman Company, Philadelphia and New York. 1972. 222 pp.

It has been almost 20 years since Bernard Ramm's *The Christian View of Science and Scripture* marked the first major breakthrough in the treatment of scientific problems with integrity by evangelical Christians. In recent years a number of significant contributions have been added to this category, including David Dye's *Faith and the Physical World,* Aldert van der Ziel's *The Natural Sciences and the Christian Message,* Malcolm Jeeves' *The Scientific Enterprise and Christian Faith,* and this reviewer's own *The Encounter Between Christianity and Science* and *The Human Quest: A New Look at Science and Christian Faith.* To this series of contributions in which adequate attention is paid both to scientific accuracy and Christian commitment has now been added this book, *Beyond Science,* by Denis Alexander. The book should be absolutely must reading for every Christian concerned with the relationship of science and the Christian faith. It is difficult for a reviewer to avoid turning rhapsodic about a book that so completely complements and supplements his own perspectives on these significant questions.

Rather than starting with an abstract and philosophical attempt to define science and the Christian position, Alexander jumps in head first into the many obvious dilemmas that call for an integration of scientific and Christian understanding; the H-bomb, military usurpation of scientific research, public ignorance of scientific goals, molecular biology, futuristic pessimism, genetical engineering, maturation of human oocytes, re-implanting human embryos, sex determination of the embryo, cloning, repair of genetic defects, formation of man-animal chimaerae, tinkering with human intelligence, drugs affecting the mind, sedatives or hypnotics, stimulants, tranquilizers, antidepressives, hallucinogens, implanted electrodes in the brain (not only for possibly evil effects but also as a possible computer radio link to control epileptic fits or to help blind people to see), brain-computer links, experiments on memory and memory shortage.

At the same time Alexander points out the common experience of a disenchantment with science per se because (1) evil is still as present in our society as ever before, (2) the concept of scientific research as coldly rational and objective is a myth, and (3) science leaves us after all with a basic sense of incompleteness.

> One of the paradoxes of modern science is that while on the one hand it appears to give man god-like powers, on the other hand it appears to reduce man to another rather puzzling animal in a very puzzling universe. (p. 44)

The author then tackles the age-old dilemma of mechanism and meaning. He emphasizes that there is no such thing as purely objective knowledge, that the goal of science is to minimize interference between observer and observed (but never really to eliminate it), that scientific proof can never be strictly obtained, that many different kinds of descriptions are needed to describe reality and not just one, that no consistent claim to complete determinism can be logically upheld. He challenges the body-soul duality and insists that man *is* a soul rather than *has* a soul.

> The soul is therefore a 'meaning word' dealing with the overall 'life' of a man, and not primarily with his mechanics. (p. 60)

He views the Biblical doctrine of creation as indicating that God is constantly in action creating and maintaining the universe today,

> According to this view, which is derived from the Bible, he has not only created everything in the past, but is actively creating everything now and will continue to do so in the future. Everything is held together and consists by his power. (p. 64)

> Now when we use the word 'supernatural', it does not mean that what we call supernatural is any more or less an activity of God than any other aspect of nature. (p. 138)

Alexander makes clear that science as god has failed on every account. Biological evolution, for example, has been extrapolated to justify two mutually exclusive economic systems—communism and capitalism. Another absurd extrapolation is that evolution can give rise to

an ethical system. The common assumption that "what is" can define "what ought to be" is the "naturalistic fallacy." Sociological "explanations" for religion, Logical Positivism, and Existentialism are all shown to be inadequate.

Finally Alexander invites the reader to return to "Square One" and start over again on the exposition and evaluation of life from a Christian perspective. He turns his attention to the ultimate questions: What is the ultimate power which animates the universe? What is life? What is man? Who am I and what am I doing here? Having shown the bankruptcy of scientism and humanism, he challenges a la Francis Schaeffer the common world view of man in a box.

Accepting the Biblical God as our basic presupposition, however, makes science possible, gives man a real and ultimate value, and provides meaning as well as mechanism to the universe. Finally after a masterful representation of the Christian option, he returns again to his theme,

> The scientist who is a Christian sees the scientific method as neither completely objective nor completely individualistic. . . . He also realizes that there is no logical contradiction between 'mechanism' descriptions of phenomena and 'meaning' descriptions. He realizes that many levels of description are both valid and necessary. (p. 203)

This approach agrees so completely with my own in *The Human Quest* that there is little more I can say.

The Christian basis for ethics carries for Alexander a number of immediate consequences in the interaction between science and Christian faith: sex must be joined with marriage, marriage with parenthood, and child-rearing with the home; artificial insemination by donor must be forbidden; "cloning" should be forbidden; family control systems involving genetic engineering should be resisted; attempts to create a man-animal chimaera should be attacked; freedom of choice must be defended free of an external use of violence, drugs or brain-washing.

The summary of the book can be given in a final quotation.

> An answer that is to satisfy must *both* account for the real world *and* not limit man to what is less than human by removing the physical, or the mental, or the spiritual, or any other aspects of man's social, rational, artistic or moral capabilities. (p. 211)

The only possible criticism of the general utility of the book is that of some 110 references given in the Bibliography, less than about 10% are by American authors. A little more representative selection would be helpful for the serious reader. At least it keeps us humble.

(*Also published in* Christianity Today, *August* 10, 1973, *p.* 30).

Reviewed by Richard H. Bube, Professor of Materials Science and Electrical Engineering, Stanford University, Stanford, California.

Further Responses on Inerrancy (*Journal ASA* 24, June 1972)

Fuller's presentation may be summed up like this: "The Bible is free from all error in revelational matters, but its non-revelational statements lie outside the category of inerrancy." And yet, who would want to disagree with this—that the Bible is free from all error in its *revelational* matters? Yet the question remains, just what is revelational, and who is to say? Is it simply the Sermon on the Mount? Is it restricted to God's redemptive acts? Or could it be that the category includes everything except "non-revelational matters, which we define as capable of being checked out by human reason?" But Christ's resurrection is capable of being checked out by human reason. And I don't think that is what Fuller really intended to say when he proposed that "revelation concerns what the eye cannot see." This last assertion is undeniably an appealing position: you never have to worry at all, because if some new datum comes up that appears from human investigation, why, it can't contradict revelation, because revelation stops being revelation as soon as it becomes contradictable(!). All this indicates that clarification is needed. Our approach, moreover, ought to be an objective one—not what we think ought to be in the Bible, but what the Bible really is; and I would like to go about this by asking Fuller three questions.

1. The first is on defining terms. Fuller has used the word *revelation*. But what is revelation? Actually the Bible has two usages. Revelation may be either a process or a product. In Eph. 3:3, we have the process; where it says. "By revelation was made known unto me the mystery." Revelation is thus God's way of communicating knowledge that men do not otherwise have. It involves, moreover, some of the greatest truths that men can know, pre-eminently, that God sent His only begotten Son to be our Saviour. In this regard, I rejoice in the warmth of Fuller's message: we are brothers in Christ; and some day, if the Lord tarries, I trust we will be meeting around the throne of our God in heaven. Negatively, however, if this be our definition, namely of revelation as a process, then clearly not all the Bible is revelation. In fact, only a relatively small part of it would be, if we consider all the historical books of the Old and New Testaments.

Yet on the other hand, revelation may define a product. For example, Rev. 1:1 speaks of "the revelation of Jesus Christ, which God gave unto Him to show to his servant." What then is included in that which Scripture calls the "revelation"? There are propositions like Rev. 2:13, that a man called Antipas was martyred at Pergamos, or 2:20, Jesus' revelation, when He said, "thou sufferest that woman Jezebel . . . to teach" at Thyatira. Such items are knowledge that men already had and that anybody who was there could have discovered. But God confirms this knowledge; and it is in such a sense, as a product, that the Bible is revelation: it is truth which may have come to men by natural means, but which God confirms.

This leads directly into another definition, of the term *inspiration*, with which we are very much concerned. Inspiration, likewise, may suggest a process. II Timothy 3:16 says,

"All Scripture is *theopneustos*" literally, "God breathed," indicating a process. But, inspiration is also a product; for Paul says *the Scripture* is given by inspiration—and this is a book. So let me propose, for working definitions, first, that revelation as a process makes truth known, and that inspiration preserves truth in writing; and second, that the resulting product is a composition of divinely guaranteed truthfulness. As our Lord affirmed in John 10:35, "the Scripture cannot be broken." We need hardly quibble over available synonyms. The Lord said, "not broken"—we could as easily say, infallible; we could say, inerrant; or we could say, authoritative. Kantzer, at Trinity, has given a definition of inerrancy that is widely accepted: that inerrant products "never wander into false teaching."

But where does this leave us in respect to "non-revelational" material in Scripture? Fuller would limit what is "revelational" to certain elements within the Bible, maybe to most of the elements (maybe not); but there is still a limitation. Unless I misjudge, he is proposing that Scripture is "partially inerrant." But this strikes me as being a self-contradictory combination, rather similar to the Roman Catholic position on the infallible Pope. This latter would say the Pope is infallible when speaking *ex cathedra*. But when does the Pope speak *ex cathedra?* The perception of this difficulty is not limited to us here at Wheaton. The president at Fuller Seminary, David Hubbard, circulated recently a statement which bears out the fact that he knows what inerrancy is; and just because he knows what it is, he dislikes the term. He said,

> "The term inerrancy, to be true to what the Bible does and teaches, has to be so radically redefined that it loses its meaning. Inerrancy is too precise, too mechanical a term to describe appropriately the way in which Gods infallible revelation has come to us in a book."[1]

He thus takes issue with his colleague, Dr. Fuller, and raises the same question that I raise: is it really cricket to talk about a product as inerrant, when one holds that it contains things which are errant? Furthermore, once we start doing this, is the term "infallible revelation" legitimately applied to the Biblical product either? William E. Hull, who is Dean of the School of Theology at Southern Baptist Theological Seminary in Louisville, has taken the next step beyond President Hubbard's. You see, Fuller likes "inerrancy;" Hubbard doesn't like inerrancy, but he'll buy "infallible;" and Dr. Hull says this,

> "No, it is not wise to call the Bible 'infallible.' The term is subject to too many problems to become a controlling concept in our witness to Scripture. Let us say, kindly, but firmly, that here is not the decisive place for our denomination [and if there are Southern Baptists in the audience, please pardon this!] to take a stand, nor is this an issue worthy of splitting our ranks. There are many wonderful unambiguous affirmations that we make all about Scriptures, but this [infallibility] is not one of them."[2]

So, he says, Let's face it, and don't use the term!

But what of the objective data? What does the Bible itself say? Paul, in Acts 24:14, claimed that he was "believing all things which are written in the law and in the prophets," which surely suggests the Biblical approach to inerrancy. In II Timothy 3:16 he said that "all Scripture is *theopneustos,*" or God-breathed. In John 10:35 Jesus taught that *"he graphe,* the Scripture, cannot be broken." The first question, accordingly, which I would direct to Fuller is this: Among the affirmations of the Biblical writers, does Scripture distinguish revelational from nonrevelational elements to the detriment of the latter? If it limits revelation as a *product* (not as a process) to what are but parts of Scripture, we had better admit it; but if it doesn't, we had better be careful.

2. This raises a second objective question: whether indeed the definition that is found in Scripture is right. You see, a given claim might be in the Bible, and still be wrong. Here also we must face the danger of subjectivity, of trying to make matters into what we think they ought to be, rather than what they really are. I have seen this done by my evangelical friends. They may make propositions like this: "God is truth; the Bible is God's; therefore the Bible is truth." But does this follow? Suppose we were to substitute for "the Bible" the concept of "the church." The syllogism would read like this: "God is truth; the Church is God's; therefore, the Church is truth." The fact of the matter is: God did not have to commit Himself to Scripture or to give us an inerrant Bible; He did not, in truth, have to give us any Bible at all, if we limit our thought to what *we* have to have. Fuller has stated that revelation's purpose is to disclose God's redemptive acts in history, so that men might be wise unto salvation. But this does not require inspiration. Peter, Paul, John, and the others could simply have written down what they knew. Their writing would not have had to be infallible. This is, by the way, what many believe today—that there was revelation, but not inspiration. Then we could dodge the whole problem! But that is not what we want to do. We want to ask ourselves, not what God *should* have done, or what we think He *ought* to have done, but what He *did* do. Now, how are we going to find out?

At the outset, let me agree with the proposition which Fuller laid down, that we draw our data from history. I feel that he rightly criticized Dr. Edward Young for resting faith "simply on the testimony of the Holy Spirit and nothing else." Confessedly, we do accept the Bible because of the internal testimony of God's Holy Spirit; but how does the Holy Spirit speak to us? That is the question. I think we must say He speaks to us through history, and specifically, if I could quote the statement of Fuller himself, "God is revealing Himself to man, entered into the very stuff of history. 'The Word became flesh.' " He then later quoted with approval the dictum of Dr. Warfield,

> "We do not adopt the doctrine of the plenary inspiration of Scripture on a priori, or general grounds of whatever kind. [In other words, inerrancy did not *have* to be.] We adopt it specifically because it is taught as truth by Christ and His apostles."

So we ask, What then did Jesus Christ and the apostles actually teach? Now, unquestionably, they show that the Scripture's main purpose was to make men wise unto salvation. But I'm afraid there's been a sleeper in Fuller's use of this phenomenon; while it is the Bible's main purpose, does it thereby rule out Scripture's other purposes? We could read the introduction of the book of Proverbs; and it contains a whole series of purposes, including how to read riddles and give subtility. Let me therefore take three examples out of the teaching of Jesus. I am trying to keep this objective, not what we think the Bible ought to be, but what does Jesus Christ tell us? Did God really commit Himself to this Book? And did He really commit Himself to its material as well as to its spiritual aspects? Here are three verses, by no means exhaustive, but representative. (1) Matt. 19:5, which is a quotation from Gen. 2:24. Yet Gen. 2:24 is not a statement by God; it is a statement by the writer of Scripture—presumably Moses. But Christ introduces this narrative statement of Moses by the words, "God created them male and female from the beginning, and said . . ." and then proceeds to quote Gen. 2:24. So as far as our Lord was concerned, what Moses said was equivalent to what God said. (2) In Luke 4:25 our Lord said this, "In the days of Elijah, the heaven was shut up three years and six months when great famine was throughout all the land." This is a matter-of-fact statement. It is also, by the way, a highly questionable statement; for the weather seldom goes three and one-half years without raining in Palestine. But this is what the Lord said; Jesus Christ, apparently, believed the historical assertions of Scripture. (3) Matt. 24:15, a statement that the prophet Daniel predicted an abomination of desolation. Our Lord also said, "When ye *shall* see the abomination of desolation spoken by Daniel the prophet . . ." indicating that it had not yet been fulfilled when our Lord spoke, in approximately A.D. 30. Now, I know that some of Fuller's colleagues believe that the prophet Daniel need not really have spoken these words, but that they could have come from an anonymous writer in Maccabean times, and that they may be referring to something Antiochus Epiphanes did back in the years 168-165 B.C.

But, why am I bringing up these three verses? Because they make it clear what sorts of things our Lord had to say, even though He did not have to say them. You see, He could have spoken about the people in the days of Elijah without mentioning anything about the famine having lasted for three and one-half years. He could have talked about an abomination of desolation without suggesting that Daniel wrote it. These are just the things he *did* say; Fuller has given us a proposed solution to such words. He asserts, "Surely Jesus, in His omniscience, knew perfectly well that [the facts might be otherwise], but he used this facet of the culture of the people to whom He was speaking as a vehicle." But, this, I think, is very serious. It questions the veracity of what Jesus Christ has said. Perhaps we should not contend for Jesus Christ's omniscience.

He did not claim total knowledge when He was here on earth. For instance, about His second coming, He said. "No man knoweth the day or the hour, no, not the angels, neither the Son," Mark 13:32, meaning, "I don't know." But when He did not know a matter, He was careful to say He didn't. On the other hand, John 3:34 states, "God giveth Him not the Spirit by measure," but that when He does speak, He "speaks the words of God." It is true that Fuller has argued that He *had* to use these false forms. He said, "Any revelation must be so accommodated," that "nonrevelational cultural references demand that they be left unchanged." This I fail to see. Jesus did not have to say that Daniel spoke those words in Matthew 24:15. In Hebrews 2:6, for example, the writer said, "One in a certain place testified saying . . ." The writer could have said it was David; he could have said it was the eighth Psalm, but He didn't. One doesn't have to say these things. And when one does say them, it raises the second question that I would address to Fuller: Is Jesus Christ truthful?

3. My third question gets down to why anyone should want to question taking Jesus at His word; it brings us to those difficulties that we, in our thinking, experience over some of the phenomena of Scripture. Frankly, I was not impressed by the examples which Fuller adduced as errors (of a nonrevelational sort, of course) in Scripture. He cited the problem of the grain of mustard's being the smallest seed. The Greek form is *mikroteron . . . panton ton spermaton*: and Dean Alford, who is no mean scholar, has said flatly that this is "not for the superlative,"[3] that the words do not say that it was the smallest seed. This is one approach that Christians have taken. Another approach might be to grant the superlative, but to ask how context affects the meaning of the words concerned. Let me illustrate from Luke 2:1, which says that there went out a decree from Caesar Augustus "that all the world should be taxed." Augustus, of course, did not tax all the world; he did not tax the Parthians—they were outside the Roman Empire. Luke knew that very well, but he knew what his audience would understand him to mean when he used the word *world*. It is the hermeneutical principle of the *usus loquendi*—that one must take a word in its context. But what is this context? Norval Geblenhuys observed, "The grain of mustard seed is the smallest kind of seed that was sown by farmers in Palestine."[4] Note carefully, he does not say they *regarded* it as the smallest seed, it *was* the smallest seed that was sown by farmers in Palestine. If we take the phrase in context we have another approach to the problem.

Fuller's examples of errancy concerned Abraham and whether or not he left Haran for Canaan when his father died. Fuller might have approached the problem through textual criticism, by accepting a non-Masoretic reading;[5] but he chose to retain the Masoretic Hebrew as the more accurate form. Yet without (any) appeal to textual change, the following syllogism, based upon what Fuller himself has given us, seems quite valid: (1) Abraham came to Canaan after his father Terah died (Acts 7:4); (2) Abraham was then 75 (Gen. 12:4); (3) Terah died at 205 (Gen. 11:32); (4) therefore, Terah was 130 at Abraham's birth. The problem is how Abraham might have "found it difficult to have a child at 90, if his own father had begotten him at the age of 130." But there are other relevant data. First, Terah had had other children when he was 70 (Gen. 11:26), while Abraham had not. That makes a difference. Compare how the birth of Abraham's six additional children after Abraham's age of 137 (Gen. 25:1, 2) illicits no surprise whatsoever, because he had already started having children, just like Terah had at the age of 70. And yet Abraham had indeed had Ishmael at the age of 86, so the difficulty seems to lie primarily in Abraham's having a son through Sarah; see Gen. 17:18-19. Is then the question how Abraham found it difficult to have a child at 90 if his own father had begotten him at the age of 130? Well, if you just had a child at the age of 86, having another at the age of 90 would not be so hard. And if it is Sarah's problem, why then this was a hurdle to which age on the part of Terah did not apply.

But let us assume, for the sake of argument, that these are questions that we cannot answer; where do we go from here? After all, I think I could have gotten some other questions myself which I would have had difficulty answering; and I think we *all* will as we read the Bible. If we are honest with ourselves, we will find things which we must admit we cannot explain. What should we do then? Fuller has warned that to rule out on theological grounds historical data that casts light (= doubt?) on a Biblical writer would make it questionable whether any historical datum should ever be allowed to illuminate the meanings of the text. To this I would reply definitely negatively. Of course we rely on historical data; that is why we believe in the resurrection of Jesus Christ, and His historical teaching is why we believe the Bible. But, I think we *do* question any human judgment, based on any data, which rejects the Biblical data. For example, to question whether Daniel really spoke those words about the abomination of desolation is not legitimate. It may indeed be a plausible surmise that the author was not the real Daniel, but rather a pseudonymous character in the Maccabean age; but when Matthew 24:15, which is the word of Jesus Christ, says the author was Daniel, it had better be Daniel! What about the three and one-half years of famine under Elijah? Granted that a scientific observer may say, "I haven't seen a three and one-half year drought in Palestine since we started taking records." But here is the problem: in natural science, we accept our own rational judgments as the basis for our conclusions—it is the inductive method. But in historical science, we do not make inductive conclusions: in historical study, we have to go on the deductive basis of testimony. What I think Julius Caesar did, doesn't make that much difference; the important thing is, what do we have by way of record

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I had motives for not wanting the world to have a meaning; consequently assumed that it had none, and was able without any difficulty to find satisfying reasons for this assumption. . . . The philosopher who finds no meaning in the world is not concerned exclusively with a problem in pure metaphysics; he is also concerned to prove that here is no valid reason why he personally should not do as he wants to do . . . For myself, as no doubt for most of my contemporaries, the philosophy of meaninglessness was essentially an instrument of liberation. The liberation we desired was simultaneously liberation from a certain political and economic system and liberation from a certain system of morality. We objected to the morality, because it interfered with our sexual freedom; we objected to the political and economic system because it was unjust. The supporters of these systems claimed that in some way they embodied the meaning (a Christian meaning, they insisted) of the world. There was one admirably simple method of confuting these people and at the same time justifying ourselves in our political and erotic revolt; we would deny that the world had any meaning whatsoever.

Aldous Huxley
Ends and Means, Chatto (1937). Quoted from R. F. R. Gardner, *Abortion: the Personal Dilemma*, Eerdmans (1972), p. 57.

that tells us what he did do? In other words I would say at this particular point, if Jesus Christ said there was a three and one-half year famine back in the days of Elijah, 850 B.C., it is my business to accept it, and not to question it.

This then leaves us with a very serious and a very important question, which has practical implications for our church today. For Titus 1:9 insists, "A bishop must hold fast the faithful word as he has been taught." Paul lays this down as the basis for accepting a legitimate Christian leader. Where this leaves me, then, is with a final question: namely, should evangelicals accept into church leadership those who oppose human judgments to the admitted assertions of Scripture?

[1]Circular letter to the alumni of Fuller Theological Seminary, Summer 1970, p. 2.
[2]*Crescent Hill Sermons,* August 16, 1970, p. 7.
[3]*The Greek Testament,* I:144.
[4]*The New International Commentary on the NT, Luke,* p. 377; cf. the emphasis in Mk. 4:31 on its being "sown in the earth."
[5]Even as in Gen. 47:31, the LXX reading "staff" could well represent the original Mosaic form.

J. Barton Payne
Covenant Theological Seminary
St. Louis, Missouri 63141

I was much discouraged by the article on the nature of Biblical inerrancy by Daniel P. Fuller. Fuller's position, and I believe also Bube's, bears remarkable resemblance to the position that was strongly opposed by Warfield, Machen and many others in the 1920's and 30's. How well do I remember the examples of men who salved their conscience in their ordination vows in the Presbyterian Church by saying that they believed that the Bible was infallible in areas of faith and life, but that it was no better than any other book in matters of history and science. Now it is being said that the Bible is inerrant in revelational matters, but again the inference is that we must allow for mistakes in matters of history and science. I gather that they would feel that we dare not base too much on the fall of Jericho for fear some archaeologist might prove that there was no Jericho in Joshua's day.

It would, of course, be comfortable for us to have a religion that was unassailable from the viewpoint of history, but such a religion would have to be one devoid of historical foundation. There are such religions, but Christianity has never been counted among them.

Of course, there are many objections to the view that Bube and Fuller espouse. It is not the view that the Christian church has held and quotations to this effect could be given back to the Church Fathers. These men, of course, did not have scientific problems, but the problem of alleged contradictions was an obvious one, and repeatedly they say that there are no real contradictions in Scripture. Of course, a further problem is that Christ's authority is at stake, inasmuch as he repeatedly refers to this sort of thing in the Old Testament and gives us his approval. A logical conclusion often drawn is that Christ also is mistaken. This only leads us deeper into subjectivism in our approach to the Scriptures.

I am sorry that the *Journal ASA* feels that this sort of thing needs to be publicized in its pages. I am aware that the doctrinal basis of the ASA has been changed. I spoke against the change and now I see the results. It seems that the ASA, founded to support the historic Christian doctrine, has become the sounding board for divergent ideas. I know Bube feels that it is the business of the *Journal ASA* to stimulate discussion and give various sides of different questions; however, the historic doctrine of verbal inspiration (not as presently defined) should not, in my estimation, be up for grabs.

R. Laird Harris
Covenant Theological Seminary
St. Louis, Missouri 63141

Responses on Dialogue on Evolution (*Journal ASA* 24, December 1972)

I do not wish to detract from previous Editors of the *Journal ASA,* but I do think that Bube has done an outstanding job and has given us a very exciting organ in which to express our opinion. Good work should always be recognized.

The *Journal ASA* 24, December (1972) was particularly interesting because of its balance. Being a biologist, my attention was naturally focused on the dialogue on evolution. This reminded me of the November issue of the BSCS Newsletter, No. 49, which contains several outstanding articles of a pro-evolutionary nature. (Some of you may wish to send in your 25 cents to the BSCS Newsletter, P.O. Box 390, Boulder Colorado 80302 and "get the latest scoop.")

One of the best defenses of evolution was offered by William V. Mayer who is located at the University of Colorado. One of his better points is that if we are to insist that the Garden of Eden story be told in the classroom, why shouldn't we allow equal time to stories of origins emanating from other religions? This does seem like a fair question. Many of our teachers have been brought up in the Christian tradition and would have little trouble with Genesis and, with proper coaching, they probably could discuss, briefly at least, other theories of origin. As far as Christianity is concerned, however, I am fearful that more harm than good will come to "the Faith" through such an approach especially if Genesis is treated in a literal sense. This is *not* to deny that some sort of creation did actually happen.

Mayer is appalled that one man, ASA member Vernon Grose, a member of the Assembly of God Church, should be able to sway the entire State Board of Education in California in his favor. As you know, there seemed for a time to be a likelihood of the Creation story being included in biology textbooks in California (and probably throughout the country) as a result of Grose's original efforts. I do not suppose that we should compare Grose with Einstein, Darwin or Newton but the fact remains that the opinion of one man has in the past prevailed over that of the majority.

In Colorado, Mayer points out, there is a bill in the legislative mill which makes the teaching of Biblical Creation mandatory. Teachers and students, have, in this bill, the academic freedom to choose which theory of origins they prefer. Mayer believes, however, that the *teacher* should have the academic freedom to "teach what he believes to be factual—in accordance with guidelines laid out by authorities in that discipline." Now I have known a great many teachers in my lifetime and I know that many of them, because of their religious training, would *rather* teach Biblical Genesis than Evolution. They do *not,* however, have the freedom to do this because of the "authorities" mentioned above. In this same connection and on another page of the BSCS issue, we learn that the National Association of Biology Teachers is now raising funds for the "NABT Fund for Freedom in Science Teaching." We assume that all monies raised will be used to protect the rights of those who wish to teach Evolution and not one penny will be spent on those who wish to teach Special Creation. I wonder what kind of freedom we are really talking about?

On the other side of the coin, we find a provocative statement by a committee of the American Association for the Advancement of Science which states that the various accounts of creation are parts of the religious heritage and are not scientific statements of theories—and that such accounts are not capable of verification. They go on to say that since they are religious in nature and accepted only in faith, they should not be taught as reasonable alternatives to scientific explanations for the origin and evolution of life. Conservative Christians will probably not accept such a viewpoint but then they do not understand that scientists can only study and evaluate that which can be apprehended by the senses or by auxiliary machines. On the whole, scientists are honest. They have overthrown many apparently well-founded theories in the past and I, for one have confidence that, if the theory of evolution is to be cast aside, it will be the scientists who will do it and not the nonscientists.

As far as Special Creation is concerned, I believe that it is highly *improbable* that the *present* organic complexity could have come about only by the operation of natural law. In other words, someone, whom we shall call God, set the main pattern. This is not to say that some sort of divine creation occurred a few thousand years ago or that it occurred in the figurative language of Genesis.

As far as organic evolution is concerned, several "factual" observations can be made. One is that the *type* of evolution resulting in the formation of new taxa is going on constantly today and that this phenomenon can be both observed and regulated in the laboratory. No doubt, the formation of new taxa has been going on for millions of years. The other observation is that the belief in phylogenetic or macro-evolu-

tion is an extrapolation and not nearly as "factual" as speciation described above. This is then the meeting ground of creationists and evolutionists. I am *not* trying to satisfy both sides (this would be impossible) but rather to set forth a *new* position based on the improbability of both "Genesis Creation" and phylogenetic (amoeba to man) evolution. As on television a commentator closes his program, "This is the way I see it."

Irving W. Knobloch
Botany Department
Michigan State University
East Lansing, Michigan

Following are a few comments on the dialogue, "Paleontologic Evidence and Organic Evolution" (*Journal ASA* 24, December 1972).

First, I would like to add my name to the "sizable minority" of readers who consider the discussion of evolution and the Christian faith worthy of serious discussion in 1972/1973, and I congratulate the editorial staff for pursuing it. (Incidentally, it would be interesting to know just how large is the "majority" who feel such a discussion is of historical interest only. I'm not aware that a poll has ever been taken).

Second, if the purpose of this second dialogue is, as the editor states, to show "whether the available evidence indicates that evolution has taken place", why is it limited by title specifically to the field of paleontology? Surely one reason why the evidence with respect to organic evolution has been traditionally so hard to summarize is that it is essentially interdisciplinary in nature. Important as the paleontological data is, it can't stand alone. I sincerely hope I have mis-construed the introductory statement, and that geologists and other pertinent disciplines will be heard from in later dialogues. If you *don't* plan to do this, how about laying it on?

Finally, I confess, regretfully, that I was disappointed with *both* presentations. The regret is because it is evident that both men invested a good deal of effort into their papers, and it would be a pleasure to give one or both a "well done" vote. The problem is that what would most benefit the reader (at least in my opinion) would be a pair of presentations that would illuminate the subject from two different points of view, but in which a scholarly balance would be maintained by both writers. In actuality, however, both seemed to approach the dialogue as a debate in which the goal was to score more points than the opposition.

This sounds harsh, I know, and I hasten to add that there is a good deal of useful material in both presentations. However one wonders why Cuffey spent time emphasizing how many of the paleontologists, and the scientific community as a whole, agreed with the evolutionary view, and why Moore chose to make his stand on the technical ground that nothing which happened historically, and which could not be repeated, can ever be said to have been "proven". It would have been refreshing to have Moore discuss in detail his interpretation of the progressive changes which, as Cuffey points out, appear in parts of the fossil record. It would also have been helpful if Cuffey would have admitted the (to some of us) striking lack of connecting fossil forms between the major groups of plants and animals, rather than simply trotting out the few candidates which exist.

The result of all this was an interesting, and, at times expert debate, but the reader was left with the feeling that perhaps the most interesting items (and maybe the most pertinent to the basic question) were precisely the areas each dialoguer left un-discussed. Even with these shortcomings, however, the treatment was useful, and I will look forward to the next dialogue.

Charles G. Coleman
6217 *Beachway Drive*
Falls Church, Virginia 22041

No Moral Basis for Abortion

I have a few comments on some of your articles in *Journal ASA* 25, June (1973). First, perhaps Mr. Shacklett should read Jeremiah 2 with particular emphasis to verse 34, also Romans 8 with emphasis on verse 28, remembering a child's coming into the world *is* one of the things which do work "together for good to them that love God." Therefore, a Christian has no moral basis for having an abortion. The Christian woman who has an abortion is only showing a lack of spiritual growth and trust in the Lord. (These references could also apply to most of your other articles in this issue, especially the one by John B. DeHoff.)

As for brotherly love, Paul wrote I Corinthians 13, but he also wrote Romans and II Thessalonians (note II Thess. 3:14, 15).

Jean Moore
3907 *N. Pershing*
Arlington, Va. 22203

On Teaching Creation and Evolution

I enjoyed the statements by Bube and Fischer under the heading "Creation and Evolution in Science Education" in the June 1973 *Journal ASA*. I feel, however, that there are some statements in Bube's otherwise fine article that should not go unchallenged.

Bube states: "To the best of my knowledge, current forms of 'creation theory' cannot be contradicted by empirical data, even in principle." (page 69) I would disagree. A creation model demands "regular and systematic gaps" in the fossil record and in the flora and fauna of today's world; it demands genetic variation within definite limits—in other words, evidence that genetic change has no limits would contradict the creation model. Creationism would seem to demand a universal principle of decay in nature (Romans 8:20ff.) On the basis of a creation model, one would expect strong evidence of design in nature. Evidence contrary to any of these points would seem to spell trouble for the creation model.

Bube would seem to be beating a "dead horse" when he criticizes references to "creation with the appearance of age." He says: "in such a case the scientific age of the earth *is* what it appears to be, and no possibility exists for contradicting the theory empirically." I would suggest there is *no* scientific age for the earth. *All* suggested ages are based on assumptions that are quite untestable and non-observable. A rock has a certain "age" only when one accepts certain assumptions about

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Always the great Christian word is **and.** *In a number of situations the Christian insight is that* **either-or** *produces a heresy while* **and** *can bring us close to reality. . . . . It is part of the Christian understanding of reality that all simplistic answers to basic questions are bound to be false. Over and over, the answer is* **both-and** *rather than* **either-or.**

D. Elton Trueblood, "The Self and the Community", pp. 35, 40

Trueblood . . . rightly emphasized the holy conjunctions **both-and,** *over against* **either-or.** *But I fear the situation today is neither holy nor heretical; instead we have the demonic* **neither-nor - neither** *genuine personal piety* **nor** *genuine communal relevance.*

Douglas D. Feaver, "The Failure of a Religious Subculture", p. 45. Both quoted from *Quest for Reality: Christianity and the Counter Culture*, C. F. H. Henry, Ed., InterVarsity (1973)

the existence and balance of radiogenic materials in the rock at the time of the rock's formation. Thus, on the basis of orthodox assumption lava flows known to be only a few hundred years old give an "appearance of age" when tested by radioactive methods yielding dates in the millions of years. But such an appearance of age is relative to one's starting assumptions, and is not determined by the factual scientific evidence at all.

Bube attempts to eliminate "category confusion" (page 70), but I am not convinced that he has succeeded. I am amazed to read that "spontaneous generation and evolutionary process are mutually exclusive mechanisms." This is quite incorrect. Spontaneous generation is a necessary ingredient in any non-theistic view of evolution. It is, by definition, the random, non-directed, accidental origin of life, and therefore totally unsuited for use in any theistic position. Dr. George Wald has stated, as an atheistic evolutionist: "The reasonable view was to believe in spontaneous generation; the only alternative, to believe in a single primary act of supernatural creation. There is no third position . . ." *The Origin of Life*, in The New Treasury of Science, Harper & Row, New York, 1965, page 417f.) It is impossible to accept both divine Creation and spontaneous generation; they are by definition, mutually exclusive. The atheistic evolutionist accepts spontaneous generation and evolution; the non-evolutionists accepts supernatural generation and formation of a full blown and biologically wound--up world. I also find it difficult to see how one could accept both Design and chance, but not Design and Chance (page 70). This strikes me as mere play with words.

To me, the practical approach to the whole controversy would be to select a reasonably neutral textbook, have a team of evolution-minded scientists write a unit on the philosophy of origins from their point of view, and have other groups (including special creationists) write units on the subject from their point of view. When several viewpoints are thus presented, the strengths and weaknesses of various philosophies is most likely to be presented adequately.

Vernon A. Raaflaub
Nipawin, Sask.
Canada

Review of Kuhn Disappointing

The review of T. S. Kuhn's *The Structure of Scientific Revolutions* (*Journal ASA* 25, 34-8 [1973], by Harry Cook) was disappointing in several ways. The greater portion of the article was very good, and Kuhn's book certainly deserves extended study, but some of Cook's conclusions do not necessarily follow from his discussion, nor do they accurately reflect Kuhn's position.

Cook claims that Kuhn has given an unambiguous, extremely subjective answer to the question, "What is it then that structures reality, that makes it dependable, investigable, or consistent?" Actually, Kuhn does not answer this question at all. In fact, he insists that "it need not be answered in this place. Any conception of nature compatible with the growth of science by proof is compatible with the evolutionary view of science developed here" (p. 173).

The Structure of Scientific Revolutions is a discussion of modes of perception, not of underlying reality. The statement "Whatever he may see, the scientist after a revolution is still looking at the same world" is not then a retreat. It is rather a hint at a possible answer to Cook's question. Nor does Kuhn totally disregard the concept of "Truth" in favor of relativism: it must be remembered that he is writing in an *historical* context in which the problem is irrelevant.

Elsewhere, Kuhn has described the aim of science as seeking to "explain in detail a range of natural phenomena." Similarly, Cook has said, "It is the business of the scientist to investigate this structure which holds for reality, and he should attempt to formulate laws or theories which reflect this structure." But the mere fact (*Heb.* 11:3) that this structure of reality is created and upheld by the Word does not guarantee its total comprehensibility (*Isa.* 55:8-9), let alone its status as a *teleos* for science. It is through interaction with this structure that man evaluates the reflection he has created in his own laws and theories. Kuhn does not suggest "progress toward a non-existent goal!" in a struggle where only the fittest theory survives because it "leads to the most progress". Rather it is a gradual increase in articulation of scientific theories and practices brought about through an interaction of the mind of the scientist with the material world. There is a physical basis for the paradigms of science, but there is no way in which these paradigms could be said to be formed through "direct observation" of a material reality.

A less sophisticated, but very interesting model could be used at this point. At the end of *The Discarded Image*. C. S. Lewis discusses the "truth" of different scientific worldviews. He notes that, "Here, as in the courts, the character of the evidence depends on the shape of the examination, and a good cross-examiner can do wonders. He will not indeed elicit falsehoods from an honest witness. But, in relation to the total truth in the witness's mind, the structure of the examination is like a stencil. It determines how much of that total truth will appear and what pattern it will suggest."

Cook would have done well to consult the "Postscript-1969" of the second edition of *The Structure of Scientific Revolutions* since Kuhn defends himself against many of his critics. There are also three articles which will be very helpful for those who wish to better understand Kuhn's view: J. J. Kockelmans, *Philosophy Forum* 11(1972), 231-52; D. A. Hollinger, *American Historical Review* 78 (1973), 370-93; J. F. Miller, *Religious Studies* 5(1969), 49-68. Although I would not suggest that everything in these articles is theologically tenable, they do cast a great deal of light on Kuhn's general premises.

Charles D. Kay
History of Science Department
The Johns Hopkins University
Baltimore, Maryland 21218

Seminar on Medical Ethics
San Diego, May 19, 1973

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CREATION, EVOLUTION AND THE AMERICAN SCIENTIFIC AFFILIATION*

JOHN A. McINTYRE

Department of Physics
Texas A & M University
College Station, Texas 77843

The kind of problem posed to the Christian church by the theory of evolution is not a new problem at all. The Biblical writers as early as those composing the Book of Judges had to face the same problem and they dealt with it successfully.

In order to understand how to solve the problem posed to the Christian church by the theory of evolution it is necessary first to state what the problem is.

1. Geology is a science in that it can make measurements, calculate results from these measurements, and confirm these results (usually by comparing them against other, independent measurements). Thus, the rate at which material is being laid down on the sea bottom can be measured, the age of a stratum can be calculated, and the calculated age can be compared to the age obtained by some independent measurement. I, therefore, accept the conclusions of geology concerning the age of the earth and the dating of the fossil record.

2. The present description of the historical development of living organisms is not a science for at least two reasons. First, the situation to be studied is so complex and ill-defined that it is hopeless, perhaps even in principle, to reproduce the process of evolution that occurred in history. For example, according to present evolutionary theory, genetic changes in an organism occur because of mutations. One might argue that, with many creatures, the randomness in the production of mutations would average out as it does for insurance companies when many random deaths are considered. However, according to evolutionary theory, the significant changes in the gene pool of a population occur just when a relatively small number or organisms are involved. Thus, the uncontrolled statistical factor of radiation might well play a significant role. Furthermore, many other conditions of the environment that were important for the evolution of organisms in the past are also outside our present range of knowledge and so cannot be included in the analysis of the evolutionary process.

In addition to facing the difficulty of reproducing the evolutionary process itself, scientists studying the development of organisms are restricted to using a "theory" of evolution which is, at the present time, not a theory in the usually accepted sense of that word. For, from a given set of initial conditions, there is no differential equation or any other formula in the theory that has yet led to a verified prediction of what will happen[1]. On the contrary, the only calculations that have been made successfully are those using Mendel's Laws and these laws predict that the progeny of living organisms will inherit the genes of their ancestors, i.e., the progeny will be produced "according to their kind". Thus, the development of biological systems cannot, at least at present, be described by any theory.

3. Evolution on the grand scale should, therefore, be regarded as history. The fossil records in the rocks are like pages of history. Being pages of history they are like the pages left us by Herodotus or Moses in that they contain a limited amount of information. Thus, history does not give us enough information so that we could today set up the original conditions (say, the Israelites in slavery in Egypt) and guarantee that the events following would reproduce the events of history. In particular, by setting up the original conditions as we know them we could not determine whether God intervened in the escape of the Israelites from captivity. For the same reasons, men cannot use the fossil record to set up conditions corresponding to those of some time in the past which are so precise that the events following can be guaranteed. And, in analogy to the escape of Israel from Egypt, it is not possible for men today to determine from the fossil record whether God intervened during the development of life.

Accepting this statement, that the record that we have of the development of organisms is simply historical, we find that we are on familiar ground. For, the description of history without the recognition of God is perfectly normal in our culture. The events of history have been explained on the basis of economic factors, strong leaders, scientific discoveries, geographical location, or other considerations.

However, we find in the Bible a history in which God plays the leading role. Yet, the Biblical history in no way disagrees with secular history. The facts of history are correct; however, a new dimension is added showing God at work as history unfolds. This feature of the Bible appears particularly clearly in one of the earliest historical accounts, the Book of Judges.[2] The secular historian would say that the people of Israel were defeated because their enemies had mastered the art of forging iron. The Biblical writer acknowledges this too but also includes God's activity.[3] Here, of course, the secular historian would note that the Midianites of this desert had domesticated the camel which gave them the mobility and security in the desert that a navy has on the ocean. After Mohammed, 2000 years later, the Arabs conquered the Middle East with their camel forces in just this way. No people adjacent to the desert could withstand their raids. Here, in Judges, the Israelites were just as helpless. Nevertheless, the Biblical writer indicated that God's providence is ruling over all.

Returning, then, to the history of life described by the evolutionary account, the Christian can also incorporate the Biblical account of God's activity in the development of life as described in the early chapters of Genesis. The evolutionist may strongly oppose the Biblical account since his materialist philosophy will not tolerate God; however, the Christian should have no problem with the evolutionist's account (in so far as it restricts itself to the facts), any more than the Christian is troubled by secular history.

Over the centuries, the greatest intellects of the Christian Church have developed a proper view of the relation between Scripture and secular knowledge. The American Scientific Affiliation follows in this great tradition. We have also had the privilege at this meeting of hearing how the careful, dedicated scholarship of the ASA in the past has borne fruit in our society. Dr. Fischer has recounted for us the remarkable events that recently occurred in California in the science textbook controversy. We have learned how the supposedly ill-informed orthodox Christians have challenged the supposedly invulnerable evolutionists. We have seen how the results of this challenge showed that Christians can be sophisticated and educated, and that the scientific establishment can be rigid and naive. The ASA can be proud and pleased about the conduct of its members who were involved in important parts of the textbook controversy.

I do not want to close, though, only on this note of commendation for the work and effectiveness of the ASA. I want to add also a note of regret that the influence of the ASA has been so small; that, while our scholarship is good, our public relations have, in general, been bad. The correct position for Christians to take in scientific matters relating to their faith is far from that of either William Jennings Bryan in the Scopes trial in 1925, or of liberals who reject the Bible on supposedly scientific grounds. The correct position requires sophisticated thought for its establishment. Now we see from the recent experience in California that the insights possessed by the ASA are sound and can be proclaimed effectively in our society. It is time for the ASA to become a factor in the intellectual discussion of the day. We must become an organization facing outward as well as inward and so exert the Christian influence in scientific matters that our world so desperately needs.

*A condensation of the Summary Address at the End of the 28th Annual meeting of the American Scientific Affiliation, August 1973.

[1] *Mathematical Challenges to the Neo-Darwinian Interpretation of Evolution.* Edited by Paul S. Moorhead and Martin M. Kaplin. The Wister Institute Press, Philadelphia, Pennsylvania (1967) 140 pp. Paperback $5.00

[2] The Bible, Judges 4:1-3 (Revised Standard Version)

[3] The Bible, Judges 6:1,5 (Revised Standard Version)

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	Volumes 20-22 1968-1970	Volumes 23-25 1971-1973
Paid Subscriptions at Beginning of Last Year	2300	2673
Total Pages	480	512
Papers	114	108
Book Reviews	46	102
Communications	56	49
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BOOK REVIEWS

(Reviewer's Name Given in Parentheses)

ADVERTISING

There is no Hebrew word to think; *there is no inactive thinking. Always the function of thinking is in its relation to the appropriate action. "As a man thinketh so is he." Thought is the eyes of action. God therefore is not a theological proposition but Agent and Action.*

James M. Houston
"The Loss and Recovery of the Personal" in *Quest for Reality: Christianity and the Counter Culture,* C. F. H. Henry, Ed., InterVarsity (1973) p. 28

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CENTRAL PENNSYLVANIA	Dr. T. V. Hershberger 304 Animal Sci. Bldg. Pa. State University Univ. Park, Pa. 16802
CHICAGO	Richard Carhardt Dept. of Physics University of Illinois Chicago Circle Campus Chicago, Illinois 60680
GULF–SOUTHWEST	Dr. O. Carroll Karkalits McNeese St. University Lake Charles, LA 70601
INDIANA	Margaret Hodson 4202 S. Carey St. Marion, Indiana 46952
NEW ENGLAND	J. W. Haas, Jr. Gordon College Wenham, Mass. 01984
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OREGON	Hendrik Oorthuys Dept. of Electrical Eng. Oregon St. University Corvallis, Ore. 97331
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