

Creation Research Society Quarterly

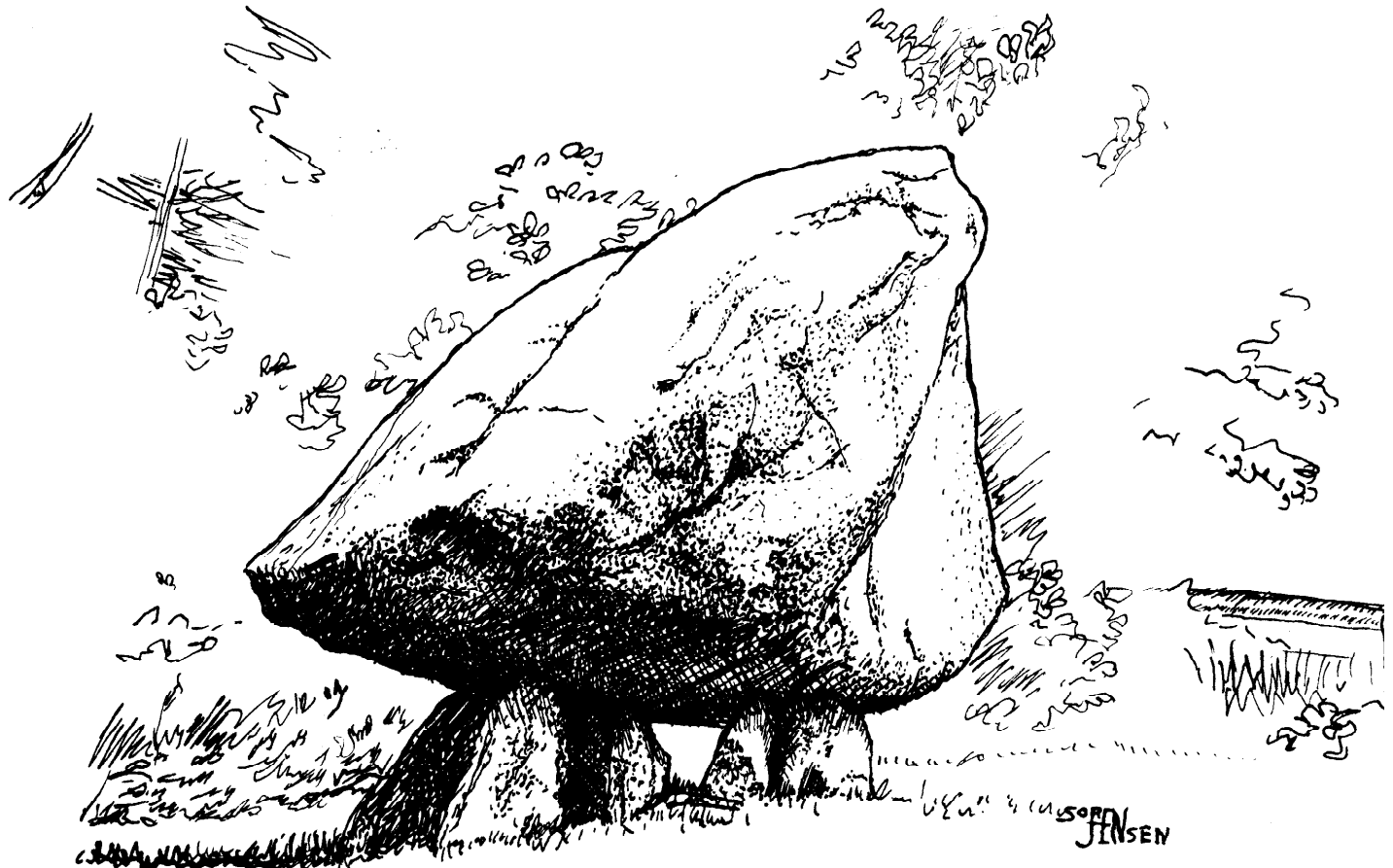
Haec credimus:

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

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An Historical Analogy

During the summer of 1976, the Olympic Games were a constant topic in Canada. I would like to mention a thought in connection with these games.

Suppose that, a long time hence, historians or archaeologists found some writings, or other evidence, about the modern Olympic Games. Suppose, moreover, that they noticed that the Games were held in the leap years. (It might not be noticed that 1900 was not a leap year.)

Would those making the discovery not imagine that there was some connection: that the Games were a leap year festival, or something of the sort? Whereas, of course, there is no connection: it is just a coincidence. (There have, it is true, been suggestions that the interval of four years, established for the ancient Games, may have had some astronomical reason; which, of course, is true of the recurrence of leap years. But still, it is a coincidence that the modern Games come in the leap years.)

This thought is offered as an illustration of how careful one must be about ancient events about which there is not much information; and how easy it could be to imagine connections which, in fact, never existed.

— The Editor

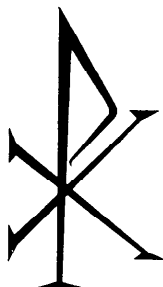


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COVER ILLUSTRATION

The cover illustration is a drawing of a dolmen at North Salem, New York. The significance of such a structure in the Western Hemisphere is discussed in the article, "Who Came Before Columbus?", elsewhere in this issue of the *Quarterly*. Also, in this issue see the item, "Ancient Astronomy in the Western Hemisphere", in the Panorama of Science section, and the book review of *The Western Hemisphere Before 1492*.

This picture was drawn by Soren Jensen, who also drew the illustrations for the article, "Who Came Before Columbus?" Mr. Jensen lives at Lyndhurst, Ontario, Canada; and that is sufficient for a mailing address. He does painting as well as pen and ink drawing, and has been involved in such projects as a "Canadiana" theme for a major Canadian motel-convention complex.

A Thought for Writers—and Editors

"To stand upon every point, and to go over things at large, and to be curious in particulars, belongeth to the first author of the story:

But to use brevity, and avoid much laboring of the work, is to be granted to him that will make an abridgement."

— 2Maccabees 2:30 and 31

SELECTION: ARTIFICIAL AND NATURAL

WILLIAM J. TINKLE*

Conditions in nature are such that some animals and plants thrive while others do not; indeed, some even die. A common expression is that nature selects some to live and discards others. Something of the sort does take place; but the result is far from that which evolutionists have alleged; indeed, it is diametrically opposite. Instead of producing new and improved types, leading for instance to the gradual development of man from a single cell like the amoeba, natural selection brings about the discarding of accidental cripples and abnormal individuals, thus maintaining a standard.

Claims of Both Sides

According to R. L. Wysong, "The assumption is made that mutations and natural selection have caused the evolution of life from the cell to man."¹ It was this assumption which enabled Charles Darwin to convince many persons that living things, including man, originated from mundane occurrences rather than from divine planning and acts. During the previous 150 years some philosophers had favored such limitation of divine power, but faith in God was so widespread that they influenced only a few. Darwin's idea was faulty, as will be shown below.

Ever since ancient times, persons who worked with plants and animals have chosen the individuals which pleased them for "seed", to become the parents of the next generation. By this process, called *artificial selection*, small changes in plants and animals have been made to the extent that they please man better. The word "artificial" as used here does not mean delusive or unreal, but performed by human art.

Darwin observed artificial selection as practiced by his countrymen and made the extrapolation that *natural selection* is a similar process; and many persons have accepted evolution because of this claim. Darwin assumed also that the rate of change is the same in one year as in the next; so that in a million years there was a million times as much change as in one year.

It has been widely mentioned that there is prodigality in reproduction; thousands of seeds, eggs, and sperms are produced for every one which grows into an organism. Creationists see that this abundance is a hedge against extinction. The death of the last individual of a species is a calamity indeed. It would seem that if evolution were true a lost species might be restored by variation from another species, but this has not occurred and is not expected to occur.

Coming now to the true reason for and effect of natural selection, Henry Morris has stated, "That is, the genetically damaged members of the population would be eliminated, hopefully, before the damage could permeate the entire population."² Natural selection is a process which gives conservative rather than creative results. Both natural and artificial selection, especially the latter, may raise the average of the group and may even produce an individual plant or animal which excels in some particular, but these processes do not produce a new and improved gene. This limitation will be explained below.

The interpretation of natural selection which is given here is not the discovery of the author nor of any modern geneticists. Edward Blyth wrote in 1835, 1836 and 1837, using natural selection to explain why species remain constant. Darwin knew Blyth's idea, for he corresponded with him; but instead of accepting his explanation, "... the famous evolutionist turned Blyth's idea on natural selection around no less than 180 degrees. Instead of natural selection serving to keep the species constant, Darwin made it into the way that change or evolution took place."³

Types of Change

Evolutionists of the nineteenth century had very dim ideas about the gene, the structure which influences a trait from parent to offspring. The clearest ideas were held by Gregor Mendel, but his work was unknown to most of the others until 1900. The gene is now known to be a code, a structure much like a word; and any one gene seldom changes when it is reproduced.

Actual variations in living things are of three kinds. The first of these is due to environment, including food, weather, competition and accidents. Such variations are often called acquired characteristics. Changes caused by environment may be large, especially in plants, but scientists now agree that such changes are not passed on to the next generation. Their presence is only for one generation unless the same environment prevails in the future.

The next type of change arises from the presence or absence of certain genes. These structures, located in the cord-like chromosomes in cells, are not all active in a given plant or animal. One person, for instance, may have brown eyes but also latent genes for blue eyes; another has blue eyes because he has genes for that variation only.

Traits such as size or production are governed by groups of genes, some for large and others for small size or production. With a constant environment it is assumed that the largest individual has the most genes for large size; therefore it is selected for seed. In such cases selection continued for many generations may bring about considerable change; but breeders find that there is a definite limit. When all the genes for the most desired expression of a given trait are assembled in one group of plants or animals, that group cannot be improved any further by selection. Examples are found in sugar beets, beans and corn (maize).⁴

The third type of change is different in that it affects the genes directly. Such a change is called a mutation; and is heritable unless it causes death, as it often does. There is general agreement that a large percent of mutations are harmful to the plants or animals; al-

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though some mutants, such as stringless beans and seedless oranges, are valued by man.

A. H. Sturtevant evaluated such facts as follows:

The studies just discussed [on *Drosophila* flies] lead to the conclusion that there is a long-time stability in the genetic basis of particular characters, but such a stability has often been questioned. . . . The more recent bio-chemical data also favor the idea of the great stability of genetic systems.⁵

Darwin's Explanation

In view of the above facts it is plain how inadequate were the ideas of Charles Darwin on the effects of selection! He lumped all changes together, having no understanding of the differences of the three types. He seemed to have no mental image of the gene, yet felt certain that variation occurred continually in every possible direction. He believed in the inheritance of acquired characters, and accepted as valid data reports which now would be discarded as being inadequate.

For example: "We hear from an excellent horticulturist, Downing, that in the United States, smooth-skinned fruits suffer far more from a beetle, a *Curculio*, than those with down."⁶ Darwin secured most of his data on selection from his uncritical neighbors as they worked in *artificial* selection; then he concluded that *natural* selection produces similar results. He reasoned:

Can the principles of selection, which we have seen is so potent in the hands of man, apply under nature? I think we shall see that it can act most efficiently. . . . Can it, then, be thought improbable, seeing that variations useful in some way to man have undoubtedly occurred, that other variations useful in some way to each being in the great and complex battle of life, should occur in the course of many successive generations?⁷

Darwin's logic is faulty. Man has kept the mutant seedless orange, propagating it by grafting, whereas it would not have survived naturally, showing that one cannot infer events in the natural environment from the methods of man. Stringless green beans are preferred for eating; but this type has nothing to favor its success in "the complex battle of life." Man's selection has produced the Jersey cow, which gives much more butterfat than needed by calves, and which would not survive alone in a jungle. The famous Darwin equated two processes, the purposes of which are distinctly different: the welfare of the predator, man, (the term is not too strong here), is distinctly the opposite of that of the organism.

Artificial selection started with plants and animals which had the cripples and weaklings eliminated by natural selection. Then man selected from among them individuals which best served his needs and whims. Keeping in mind the same ideal for a number of generations he secured plants and animals which produced an increased amount of food or fiber or conformed to a fashion. In doing so he produces creatures which are less fit for survival in the wild state. Garden plants are produced by seedsmen who have selected during many years. Yet a highly selected pure line of either plants or animals is more likely to be wiped out by disease or parasites than an unselected group. Artificial selection

gives no proof for the exaggerated claims for natural selection.

Verdict of Modern Genetics

Every student of the subject recognizes that selection effects some change, but there has been much disagreement as to the degree. Of course the shifting of the average may involve only the relative abundance of types in a population and this is no real change at all. This is the truth about the much-touted light and dark moths in England.

Personal opinion and fashion of thought have affected discussions. Sturtevant maintained, "De Vries was inclined to minimize the effects of selection and argued that it could produce nothing new. Johannsen had a similar view; but this was so contrary to the point of view of Darwin, Weismann and the whole generation that followed Darwin that it was not generally accepted. There followed a series of selection experiments by numerous workers."⁸ The present author agrees with De Vries and Johannsen and has written of these experiments in another place.⁹

The most potent help for deciding the possible extent of change is information on the nature of the gene, of which Darwin had no knowledge. L. H. Snyder and P. R. David state,

. . . there grew a belief that selection could improve a race indefinitely. The method by which selection operated was not understood until after Mendelian inheritance was understood, but was thought of as a more or less mysterious process which could be effectively continued as long as desired. With the advent of scientific knowledge of genetics, however, came the understanding that selection is actually a sorting and preserving of certain combinations of genes to the exclusion of others.¹⁰

It is not denied that Darwin made some good observations, but his ideas most at variance with the creation model came from his groundless assumptions. He wrote about the survival of the fittest, but it often has been remarked that he did not account for the *arrival* of the fit except by a bland assumption that it is simply natural for variation to occur in every direction.

Actually genes are stable at least 99 times out of 100. Instead of changing they alternate with each other: genes for large size may be numerous at one reproduction while, due to a different mating, genes for smaller size may have the plurality at another time. Such alternation of the hereditary factors, Darwin mistook for change. An actual change in a gene is a mutation and such a change is nearly always a loss.

For the degree of change of amoeba to man to occur it would be necessary to assume that greater complexity affords greater fitness. Yet daisies, very complex plants, are shaded out by pines, which are considered more simple and lower in the scale of evolution. The opossum is not specialized in structure, having a small brain and legs which are not specialized for anything in particular. Yet the range of the opossum has extended from Maryland into New England and when it was introduced into California the opossum increased in numbers.

In another respect genetics poses a problem for the doctrine of evolution of living things by natural selection. A gene has been found to consist of groups of molecules: respectively adenine, thymine, cytosine and guanine. These four serve as a kind of alphabet and the genetic message is formed by the *order* of the groups. Just as t-o-n is distinctly different from n-o-t, so a change in a gene, a mutation, is disruptive of the usual message. Darwin's fantasy of formation of more complex classes by selection of chance changes is the denial of sound genetics. The logical conclusion is that the types of living things, along with the genes, were planned and formed by the Creator.

No one has observed the formation of an improved type by selection; improved in organization and in the struggle for existence. Until this is observed, evolution by selection will continue in the limbo of wishful thinking.

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THE ANCIENTS AND THEIR USE OF METAL

ERICH A. VON FANGE*

The author maintains that the division of history and prehistory into such divisions as the stone, bronze, and iron ages, with subdivisions, is at best an over-simplification, and at worst is quite erroneous. For different materials were in use in different places at the same time, and even at the same place different materials were in contemporaneous use for different purposes. Also, the facts that iron rusts away, while bronze and stone do not, and that the ancients, not being as wasteful as we, did not leave so much scrap about, mean that archaeological samples may give a distorted picture of the kinds of metal and other materials in use.

The re-interpretation of history, proposed here, fits very well into the Scriptural chronology.

In the course of the investigation, many curious facts are discovered about the ancient use of metals.

A. Introduction

In 1819 a Danish archaeologist, Christian Thomsen, proposed an idea so devastatingly logical that no respectable author of a book on ancient history, anthropology, or archaeology would dream of not using it. Man first passed through a Stone Age, then a Bronze Age, and finally an Iron Age. The Iron Age closed about 333 B. C. at the time of Alexander the Great, after which the world entered into more modern times.

Each of the three ages was divided up rather neatly into Early, Middle, and Late periods. With a bit of a flair for sophistication, the Old Stone Age was called the Paleolithic (Old Stone), the Middle Stone Age became the Mesolithic, and the New Stone Age became the Neolithic. Some critics attempted to flaw the beautiful symmetry of the pattern by inserting a Copper Age or Chalcolithic Age between the Stone Age and the Bronze Age. Others inserted an Eolithic Age before the Paleolithic Age.

The original nine periods proved to be inadequate in many ways, and so a marvelous assortment of Roman numerals, capital and small letters of the alphabet, and Arabic numerals was used to subdivide the periods further and further. This method has infinite possibilities for expansion. No speck of dust, no pottery sherd, no

stone flake or chip need be unassigned. For the archaeologist there is a place for everything in the neat scheme, and everything is put into its proper place.

The whole scheme is a triumph for man's penchant for classifying. Only one little ripple mars the placid surface of the plan. It does not work.

Based on an elaborate set of assumptions and many decades of the most painstaking archaeological study, the Bronze Age in Palestine is said to have run from 3150 B. C. to 1200 B. C. The Early Bronze Age (EB) is given as 3150-2150 B. C. The Middle Bronze Age (MB) lasted from 2150-1550 B. C., and the Late Bronze Age (LB) was from 1550-1200 B. C.

Similarly the Iron Age was divided into Early (1200-1000 B. C.), Middle (1000-587 B. C.), and Late (587-333 B. C.). In other parts of the world and with different authorities dates for the stone and metal ages differ widely.

Sometimes the dates given for the various ages are said to be approximate, especially for the stone ages. In much of the literature, however, this qualification is not mentioned. To the uninitiated the impression is unwittingly given that at a certain point in time, the bugles sounded around the world with the message: As of 0600 hours tomorrow morning the Middle Bronze Age will begin.

In this paper I shall look more closely at the origin of the concept of the stone and metal ages, their validity, and at a number of curious things reported around the world having to do in some way with metals.

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B. Origins

Despite the massive authority of the 15th Edition of the *Britannica* (1974) that Christian Thomsen in 1819 coined the terms Stone Age, Bronze Age, and Iron Age, these terms had been in use for a much longer time. Certainly Thomsen deserves the credit for popularizing the concept by means of exhibits he prepared for the National Museum in Copenhagen in 1836.¹

Chinese historians suggested Stone, Bronze, and Iron ages already in 52 A. D. In 1758 a French magistrate suggested the same ages but inserted a Copper Age. In 1813 a Dutch historian argued for stone, bronze, and iron periods in Scandinavian prehistory.²

Perhaps some insight can be gained into the persistence of the age system of the past two centuries despite various problems by pondering the statement of a brilliant archaeologist, Franz Boas, whose life work was dedicated to establishing the late arrival of man into the New World. Boas stated that it would be a pity to have new evidence come to light which would overthrow all the admirable scientific work of the past.³ This kind of desperate rearguard action works wonders in keeping at least some of archaeology in a type of little stone age.

As Fitting says, "Since each succeeding 'generation' of archaeologists could see the 'theoretical' mistakes of their predecessors but not of themselves, they could state with certainty that 'every day and every way we are getting better and better'."⁴

The great missing link in the assumption of the stone and metal ages is the simple fact that all so-called primitive peoples are extremely conservative and simply do not experiment to develop new and better ways.⁵ The observations of the anthropologists are completely opposite to what archaeologists assume about human development. Those who changed their ways were taught.

C. The Stone Ages

Mortillet, a France scholar, followed up the classification system of Christian Thomsen with a refinement of the stone ages. Based on studies of what was assumed about the Ice Ages and of artifacts found in France, he arranged a system of time periods from oldest to youngest: Chellean, Acheulean, Mousterian, Aurignacian, Solutrean, and Magdalenian. Later the term Abbevillian replaced Chellean because the latter turned out to be identical with Acheulean.

The system was supposed to fit the whole world, but it was based on limited studies in a small part of Europe. Although half-hearted attempts are sometimes made to apply the system elsewhere in the world, the plan, as Archaeologist Macgowan says, is no more than a fifty-year straitjacket patched here and there. After fifty years of study by geologists of the world, who have devoted enormous energy to the problem, there is still no certainty about how many glacial periods there were. There was at least one such period,^{*} but beyond

^{*}Some, though, have doubted whether the motion of great sheets of ice over the ground, or the very formation of ice sheets in places which are now temperate or even tropical, is either possible physically or necessary to explain the evidence. See, e.g., Cox, Douglas E., 1976. Problems in the glacial theory, *Creation Research Society Quarterly* 13(1):25-34. (Editor)

this the vision becomes blurred despite all the elaborate statements in the literature to the contrary. The Mortillet system is tied closely to an assumption of four glacial periods with long intervals between each such period, but scholars come up with wildly different guesses on the length of these ages.

After the Mortillet system came into vogue, rudely chipped artifacts were found in formations supposedly much older than man. The classic phrase, so often repeated, was that man is much older than had formerly been believed. The stones were called Dawn Stones and the Eolithic Age was added to the plan.⁶

Cole notes that the early distinction among scholars regarding stone core and flake industries turned out to be worthless, since both techniques were used together in nearly all places.⁷

Of many other problems which soon followed with the whole scheme, one came out of Africa. Similar stone tools to those of Europe were found, but it was impossible to date them in the same way. They obviously came from a much different time. Magowan concludes that Paleolithic, Neolithic, Bronze Age, and the like, mean less than nothing as a dating mechanism for more than a single locality. Even the term postglacial means different things in two such neighboring countries as Sweden and Germany.⁸ Clearly something is radically wrong with the whole scheme. Unfortunately for the scientist, there is no palatable alternative.

Macgowan chafes at the watertight compartments of the stone ages because there are so many discrepancies. Neolithic man grew cereal grains and wove textiles, but at an earlier age man knew how to insert tiny razor-sharp flints into bone or wood for saws or sickles and developed the pottery craft. Since this seemed too much for Palaeolithic Man, scholars inserted a Mesolithic Age.

Attempts to define the Mesolithic Age are rather embarrassing, however, because again there are too many contradictions. Like the Bronze Age, the Neolithic Age suffers from a drastic shrinkage at present in its assumed length. It is almost insulting to list the great sophisticated developments in the brief time span of the Neolithic Age when it presumably took hundreds of thousands of years in the Palaeolithic Age for very slight changes to occur in chipping stones. The Neolithic is credited with pottery, weaving, cereal grains, and domesticated animals.

Then Leakey muddled everything by finding sherds and marks of basketry in Paleolithic strata in Africa. No assertion about the Stone Age is safe. Gordon Childe concludes that there was no such thing as a Neolithic civilization, but for lack of any alternative, the text books continue to carry the whole scheme with no hint of any problem.⁹

Having no better scheme to follow, Will Durant slogs through all the stone ages from Pre-Chellean (Eolithic) down through the Magdalenian, showing all the developments which distinguish the one from the other. At one age man chipped stones this way, and 50,000 years later he chipped them that way. Only the date for the first age is qualified—"about" 125,000 B. C.

More daring than most, Durant is willing to see remains of the Chellean Culture, 100,000 B. C., in Europe, Greenland, the United States, Canada, Mexico, Africa, the Near East, India, and China. Still more daring, he finds the Mousterian Culture, which features Neanderthal Man at 40,000 B. C., on all continents. Durant allows for pottery in the Magdalenian Culture, 16,000 B. C., but Glueck puts the Pottery stage at about 5000 B. C.¹⁰

Another way of dividing up the Stone Age was that used by Glueck and others in the Middle East. The Palaeolithic Age was divided into Lower (before 70,000 B. C.), characterized by pebble, bifacial, and flaked tools; Middle (before 35,000 B. C.), associated with the Mousterian Age in Europe; and Upper (before 10,000 B. C.).

The Mesolithic Age, also called the Natufian Age (before 7,000 B. C.), was divided into Lower and Upper. This age saw the "sudden" development of all cereal grains and the domestication of animals—a spectacular scientific achievement. As noted above, others credit these achievements to the Neolithic.

The Neolithic Age followed, characterized by the development of villages and pottery. The Pre-pottery stage was about 7,000-5,000 B. C., and was followed by the Pottery stage, about 5,000-4,000 B. C.

Next followed the Chalcolithic Age, about 4,000-3,300 B. C., in which both stone and copper were used. Jericho is given as the classic example of both Neolithic stages, the Chalcolithic Age, and of all the ages which followed.¹¹

The fun begins when a Neolithic arrow point, as reported by Dawson, is found in a skeleton from the Palaeolithic Age. Evidently the arrow flew over a time gap of many, many thousands of years.¹²

D. Carbon 14 Dating

In the midst of the incredible confusion in dating the past, Libby came to the rescue with C14 dating which at last placed dating on a scientific basis. Creationists can indeed accept some value to C14 dating even though there are problems. Archaeologist Griffin, a scholar's scholar, neatly sums up the problems by saying that C14 runs on the same specimen that have given results far outside allowable statistical error tend to shake the faith of the social scientist or humanist in the magic of atomic science.

By way of illustration he notes three cultures in New York, all dated at 2500 B. C., which show no cultural contacts with each other. In another case, material from a tomb pit in a mound gave a C14 date of 130 B. C. The same specimen, given a different acid treatment by the same laboratory, gave the date of 1227 A. D. Two other samples were then tested resulting in dates of 50 B. C. and 1 A. D.

Elsewhere freshwater mussel shell from a site yielded a date of 350 B. C. but this is much too early for that culture according to other evidence. Oak wood from a site gave a C14 date of 480 A. D. The date is too late by 300-400 years, so another run was planned. Charcoal from a Hopewell site yielded a date of 1050 A. D., but this is impossible for that culture. Identical materials along with reliable evidence of being contemporary in

Illinois and in the Mississippi Valley yielded dates differing by as much as 1300 years.¹³ In some situations C14 may be useful. There is no reason to be over-awed by it.

Mellaart is only typical about the state of the art of dating when he comments that the Stone, Bronze, and Iron ages, devised in the 19th century, are now in many respects obsolete, but they are still in common use and have been adapted by Near Eastern scholars. He asserts that C14 gives a more nearly absolute chronological framework for prehistory all over the world, thus supplanting earlier schemes based largely upon guesswork.¹⁴ All is well after all.

In her study of East Africa, Cole notes that deposits which cannot be earlier than 3000 B. C. were dated by the C14 method at 5758 B. C. If the C14 date fits, it is used. If it does not, "these unexpectedly early dates suggest that the deposit may have been contaminated."¹⁵

Elsewhere in Africa shells gave C14 dates of 21,000 years, which were described as "impossibly old." Living shells from Lake Edward in the Congo show C14 ages of 3000 years.¹⁶ Such findings do not help to spread confidence about the C14 method.

An attempt to re-calibrate C14 dates from analysis of cores of very old bristle cone pine wood has upset, for the time being, the favored theory of a slow diffusion from the Near East to Europe in ancient times. As a result Stone Age tombs in Brittany are now dated 1000 years older than the oldest similar ones in the Eastern Mediterranean, and 1500 years older than the first pyramids of Egypt.¹⁷ One can safely predict that this patchwork on C14 will soon be supplanted by still other attempts.

E. Bronze and Iron

One of the initial surprises in reading the literature about the Bronze Age and the Iron Age is that metals are very incidental to the whole elaborate scheme. The many subdivisions are based almost entirely on pottery. Much of the confusion about time rests on two factors: calibration of Middle East dates with the chronology of Egypt which is disastrously in error, and the long life attributed to the mud brick. Other factors, such as fire and destructive invasions, also played important roles in the many levels found in the mounds or tells of ancient cities and towns.

In the analysis of ancient tells, often 50 to 100 years are allowed per mud level. This conclusion may be plausible in a desert region where rains are all but unknown. The key to the problem of course is the duration of mud brick in rainfall. Kenyon noted that mud brick disintegrates in the rain, and in such a climatic condition the growth of the tell would be very rapid.

There are two reasons why early Jericho can be measured in decades rather than in many millennia. Garstang found that the early floors of the city were built in part on the channel of the great spring there and the water seeped upward. This resulted in frequent rebuilding. Further, there is good evidence that early Jericho was even wetter than the Dead Sea area in the time of Lot when it was described as watered like the garden of the Lord. The conventional dating of ancient

Jericho is therefore based on assumptions which simply do not hold water, to coin a phrase.¹⁸

No one who accepts the Bronze Age—Iron Age scheme has yet explained how bronze could have preceded iron. Tin is not usually found in the bronze civilization centers, which means that man conquered the sea before the Bronze Age got underway. Further, the metallurgy of iron is simpler than bronze, and iron ore is more widely distributed than copper and especially the tin needed for bronze.

Macgowan has harsh words for the so-called Bronze Age, which he calls a misnomer and a phantasm—a minor phase in the use of copper. Much of the Bronze Age is limited to the area of southern Europe, Asia Minor, and (much later) the Incas in Peru. He notes that most of the world used iron before bronze.¹⁹ With so much of the world poorly investigated, e.g., the vast stretches of Siberia, there is still much to be learned about early man and his use of metals.

Besides the obvious critical factor, often overlooked, that iron rusts rapidly and bronze does not, another significant fact must be considered. This is the ancient tabu about iron. Iron was deliberately omitted in the funeral chambers. This practice is known to have existed in Palestine, and a similar tabu was observed in Greece and Rome. In Egypt iron was called the “bones of Seth” and played a significant role in religious observances.²⁰ The Maya were very familiar with metals, but they shunned any use of metal in their buildings over a period of many centuries.²¹

The conclusion is obvious. One cannot fix a chronological period by the percent of bronze and iron objects found in tombs.

Perry massed convincing evidence that the earliest food-producing civilizations were world-wide in their impact. He identifies a long list of their sophisticated technology and culture, including metal-working with gold, copper, and iron. Precious stones, including the diamond, were sought and used. Perry leaves it to others to explain why the earliest civilizations were the most sophisticated in the ancient world, and why civilizations which followed showed many evidences of degeneration.²²

The obsession of the ancients with metals is shown by the names of key metal producing areas. Nubia was the Egyptian word for gold. Hatus, the Hittite capital, means Silver City. Cyprus is obviously the same as the present word, copper. Tarshish means a smelter, and the word Barzel or Brazil, which means iron, spread into the Atlantic.²³

Metals also became identified with heavenly bodies. The sun was gold, the moon was silver, Jupiter was electrum (a mixture of gold and silver), Saturn was lead, and Venus was copper. At a later time quicksilver or mercury was associated with the planet Mercury.²⁴

It is curious indeed that Moses, unaware how modern scholars would separate copper, bronze, and iron ages, spoke of copper, bronze and iron in one breath in Genesis 4:22. The word for brass may be translated from the Hebrew as either copper or bronze.

In the Pre-Flood world Tubalcain was an instructor of every artificer in brass and iron (Gen. 4:22). According to Nelson, the Pentateuch contains thirty refer-

ences to bronze (or brass or copper) and two references to iron. Although attempts are made to date Moses as late as possible, he lived about 1500 B. C. and spoke familiarly of iron centuries before the assumed beginning of the Iron Age.²⁵

Mining, metallurgy, and smelting were highly developed long before the universal flood, and Noah and his sons passed on this technology after the Flood. Some of Noah's descendants learned the technology before they broke away or were driven away from the first tribe of them all. The knowledge of metals or lack of it and the characteristics of the environment for a given group of people determined whether or not a metal age followed for them. Thus there were metal ages from the very beginning while other peoples live in a stone age today in remote parts of the world.

The promised land was described long before the Iron Age as a land whose stones are iron and out of hills of which the people could dig copper in Deut. 8:9. Cain, after the first teacher of metallurgy, Tubal-Cain, became the Hebrew word for smith or worker in metals. Thus the Kenites were a tribe of smiths.²⁶

F. Places and Metals

Africa In South Africa, Livingstone found survivals of ancient metallurgical processes. Evidently the smith reduced iron from hematite ore, and then forged tools from the material. Livingstone observed that the people had never known bronze, nor had they gone through a Stone Age.

One scholar observed that smelting furnaces used by natives in India and Africa were very similar. It is curious that the natives used yellow hematite to produce iron, but this powdery ore bears no resemblance to iron. Malachite, a semi-precious green stone, gives no hint that it is rich in copper, yet natives smelted this ore extensively in the heart of Africa from ancient times.²⁷

The Victoria Cavern is associated with bones of extinct lion, bison, hyena, wooly rhinoceros, and mammoth. In this deposit were found perfect bone needles, bone implements, some awls, a gouge, an oval ironstone implement, and a bone, bearing the outline of a horse's head, which appeared to have been sawed. Strangely, the horse is hog-maned, which means that mane had been clipped. The scholar investigating the site dared to suggest that metal shears had probably been used.²⁸

Akkadia Language study sheds some light on the history of metals. Akkadian was an obsolete language by 1500 B. C., yet texts in this language use words for tin, copper, lead, gold, silver, iron, and bronze. One hymn speaks of bronze as a mixture of copper and tin.²⁹ The big surprise is iron. The Iron Age had not yet begun.

Arabia Metal mining in the Arabian Peninsula was abandoned suddenly at least twice, once about 3000 years ago, and again about 1000 years ago, but this is only the more recent history of mining for metals in the Near East. The astonishing scope of ancient mining is illustrated in Arabia by the discovery of 400,000 tons of slag at just one of the mines.³⁰

During the height of the Bronze Age, two “lost” civilizations were involved in supplying Mesopotamia with

huge stores of copper. Makan, the Copper Kingdom, lay to the south and east of Bahrain in Arabia. Bahrain was part of the ancient kingdom of Dilmun. The sands of Arabia still cover most of the story of Makan and Dilmun, but Bibby has made a very interesting beginning. Some day in Oman the copper mines and old cities of Makan may be found. Dilmun supplied the great seaports which served the merchants of Ur and of Makan.³¹

Atlantis There are many wild tales and conjectures about Atlantis. Plato described a Bronze Age civilization, but he dated it incredibly early at 9,000 years before the birth of Solon. Many scholars believe that Plato is in error by one zero in his reckoning. In support of this opinion is the fact that the old Linear B Greek symbols for 100, 1000, and 10,000 are very similar and easily confused.

Despite problems with Plato's description there is a growing belief among scholars that Atlantis is to be identified with the island of Thera and with Crete, which ended in disaster about 900 years before Solon.³² If this is the correct solution, Atlantis thrived well within the so-called Bronze Age.

Baghdad A German engineer, Wilhelm König, was assigned to a construction project in Baghdad. In a ruined building which was dated to about 300 A. D., König found an old vase which had a copper-coated inner cylinder. A solid piece of iron was placed into a thick plug of asphalt. With a solution, for example, of fruit juice, the object would have been a working electric battery.³³ Electroplated articles were excavated in the same general area. Saurat found evidence of a similar technology in ancient Egypt.³⁴

In both the Old and the New Worlds, there is evidence that the technique of electroplating was known.³⁵

Catal Huyuk Although only a tiny portion of Catal Huyuk has been excavated thus far in southern Turkey, this highly sophisticated city goes back in time as far as any ancient site. The culture is described as remarkably advanced already in the seventh millennium B. C.; the technology included metallurgy.

In addition these people used a full range of pigments derived from metal ores: red, brown, and yellow ochres; copper ores, including bright blue azurite, and green malachite; a deep red mercury oxide; hematite, mauve and purple manganese; and grey galena ore.³⁶ The sources for many of their raw materials are unknown, but one must assume deep sea navigation long before it has been thought possible.

Crete It is difficult to fit an early Minoan practice into the stone and metal age pattern. Early Minoan pottery vessels were clearly copies of even earlier metal prototypes. Little clay knobs, for example, were placed for rivets on the pottery.³⁷

Egypt The early use of gemstones by the oldest civilizations is interesting. Petrie has shown that the use of hollow metallic drills, armed with gems, was common in ancient Egypt for cutting and carving in the hardest of stones. The diamond drill was used among Babylonians at a very early period. It is a curious fact that the Hebrew word for diamond is expressed by two signs which mean a boring stone.³⁸

The main purpose of Egyptian sea expeditions was to secure minerals, and it seemed that no place was too far to secure these treasures. In a similar vein, Gudea, the Sumerian ruler of Lagash about 2000 B. C., tells about getting minerals from different parts of the world.³⁹

There are discoveries about the ancient use of metals which jar the reader. Metal was used to make lightning rods in Egypt in the fourth century B. C., yet credit is given to Benjamin Franklin for this invention in 1752.⁴⁰

Aldred marvels at the sophistication of the Archaic Period of Egypt, dynasties I and II. He described a remarkable carved dish which he dates at 3100 B. C. which imitates a form originally made in metal. Eye-holes were found in needles and teeth of copper saw-blades were punched out by an unknown harder metal, but bronze was unknown at that early time. The copper saws were used with some kind of abrasive. Exquisite workmanship with gold, silver, and precious jewels was common but few pieces have escaped from thieves over the centuries.⁴¹

Elath In the coming decades archaeological surprises from the Arabian peninsula may still be anticipated. Meanwhile, Ezion-geber or Elath is the largest copper smelting location in the ancient Near East. Large deposits of copper sulphate have been found in caves and galleries which date back to workings by man at 3000 B. C. Solomon, around 960 B. C., only revived a very ancient copper industry at this location.⁴²

India The dolmen builders of the Deccan in India were mining for gold, copper, iron, and diamonds. At Bellary and Dharwar, where the dolmens are thickest, the land is riddled with old workings for these metals. Everywhere are cup-like hollows where gold quartz was pounded with stone pestles. Small crucibles were also found for giving assay for gold. At Hutti, gold mines show the extraordinary skill of the ancients. A long series of workings have been exposed down to an unparalleled depth of 640 feet.

Ancient copper mining in Hyderabad State is also associated with dolmen remains. In the same region are rich iron ores. Iron was known from the earliest times, and the techniques are practiced in the area to this day. Perry notes the striking fact that natives never seem to discover a new idea for themselves nor do they modify anything in the slightest. As noted before, strangers taught them in an ancient time.

The parallels between India and England in dolmen building and mining techniques are striking. Something happened that stopped mining activities of the ancients and prevented them from extending their operations. A great catastrophe, whose extent is not known, brought this chapter of ancient history to an abrupt close.⁴³

Iran According to Gadd there is no certain evidence in Iran of any people so primitive as to have no metal. At its earliest, Sumer was using metals, and old Susa in Elam and the ancient Indus Valley cultures had bronze hatchets, mirrors, and needles. Copper casting and working with gold and silver were common in very early sites along the Iranian Highlands and up into Russian Turkestan.⁴⁴

Soviet Union A century ago scholars observed that ancient people worked mines of metal near Krassogorsk

on the river Yenisei, 56° North. Wedges, mattocks, mallets, and hammers were found in place. Some of the hammers were of copper. In this region arrow points of copper and gold ornaments were found. Fine animal figurines were made of molten copper. The same kinds of megalithic structures, such as tumuli, altars, dolmens, and menhirs were found here as those in England and Brittany. One enormous stone still standing measured 76 feet above ground, and was 24 feet on one side by 19 feet on the other.⁴⁵

The idea of sudden climatic change in historic times must be accepted. In 1951 Okladnikov published the results of his research in northern Siberia. Between 3000 and 2000 B. C. Neolithic races spread to the very coast of the Arctic Ocean in the north and the Kolyma river region in eastern Siberia. In a region which once teemed with the mammoth and other now extinct animals, man moved in to satisfy his overwhelming urge for metals. It would be unthinkable for the same cultural pattern to exist in that climate today.⁴⁶

A site on the edge of the Gobi desert was a center of metallurgy at a very ancient time. Both copper and iron were found there.⁴⁷

Gritsai and Yatsko reported a find of bones of ostriches, camels, and hyenas in caves at Odessa in the Soviet Union in 1960. Among the artifacts were skillfully cut bones containing perfect circular holes and regular gooves. The finders suggest that metal tools were used in this process.⁴⁸

Charroux reports on a discovery in 1968 by Dr. Koriun Meguerchian at Medzamor, Soviet Armenia. It was termed the oldest metallurgical factory in the world and was dated at approximately 3000 B. C. Objects made of all the common metals were found at the site. Rocks were hollowed where ore was crushed and treated. Many furnaces were excavated, and at least some of the ore were imported.

Among the metals and alloys found were copper, bronze, lead, zinc, iron, gold, tin, arsenic, antimony, manganese, and steel. Slender steel tweezers, still shiny, were found. Scientists from many countries have verified the find.⁴⁹ Assuming that this account is true, the Bronze Age—Iron Age sequence suffers a severe blow.

Sumer Then there is the mystery of ancient Sumer. From the very beginning, Sumer produced highly sophisticated lapidary, copper, gold, and silver work. Yet the metals and stones basic to these arts are not found there. Some inkling can be gained of ancient world travel from the discovery of Sumerian clay tablets in Romanian Transylvania dated about 2700 B. C. This area is noted for a variety of minerals.⁵⁰

In Sumer, the artisans knew that 9-10 percent of tin had to be added to molten copper to create the best bronze. Both Sumer and Egypt mastered all the basic metallurgical techniques at a very early date: filigree, mold casting and hollow casting, intaglio, wire-drawing, beading, granulation of metals, welding, inlaying of one metal with another, sheets hammered so thin as to be almost translucent, repousse, gilding on wood, and even electroplating.⁵¹

Troy Scholars were astonished when Schliemann found Bronze Age artifacts at the site of Troy which

were below Stone Age levels.⁵² Despite the fact that dating is very uncertain on ancient sites, Troy illustrates the fact that Stone Age levels may be found later in time than metal ages.

Ugarit At Ugarit or Ras Shamra, an old sewer, nine feet underground, was uncovered. Completely modern looking lead drains were found in streets which dated back to about 2000 B. C. Shaped like modern manhole covers, they contained round drain holes.⁵³

Old World-New World Along with much other evidence, Honore noted the influence of the Far East in America in the manner of gold working, the use of copper, core casting, granulation of metal, alloys, use of bronze, and metal dyeing. In a similar way, he supports a Mediterranean influence in America, for example, in the way copper rivets were used.⁵⁴ The lost wax method of casting, long known in the Old World, was expertly used in the New World.⁵⁵

Constance Irwin marvels that the metal techniques of the Old and New Worlds were alike to the point where independent invention can safely be ruled out. The similarity of technique extends to such elaborate processes as casting an object from an alloy of gold and copper, then treating the surface with acid to dissolve the copper, leaving a pure gold surface. In both worlds the same methods were used in hammering, embossing, annealing, welding, soldering, strap joining, incising, champléve, cutout designs, and making objects of two metals.⁵⁶

Magowan and others have noted that bronze and copper weapons and other tools show great similarity in South America to those of the Old World. Further, metal techniques were very similar in the New and the Old worlds. Particularly with regard to the invention or discovery of bronze, it is difficult to conceive of independent invention in the two worlds.⁵⁷ It is much easier to argue for transoceanic contacts in the distant past.

Appalachians The Appalachians contained much gold, and ancient man worked this region. There is evidence that the ancients were acquainted with gold and silver mines in Upper Carolina. Copper mines existed in Tennessee and many relics of old mining efforts have been found there. It is curious that gold has not been found in the mounds of America, according to Perry. He concludes that perhaps gold mining in the Appalachians dates back to a much earlier time.⁵⁸

Arizona Ceram is astonished about little cast bells found in southwestern United States, attributed to the Hohokam people. For this process a melting temperature of 2066°F. is needed. How this artistic achievement was made, no one can say.⁵⁹ Macgowan comments on the similarity of the bronze and copper bells found in China and in Arizona.⁶⁰

Traces of prehistoric mining have been found in much of Arizona where gold, silver, and copper were sought. Ancient oven furnaces have been noted along the Salt River where copper was smelted in the past.⁶¹

California There is the curious story that a small piece of metal, shaped like a bucket handle, was found when a piece of gold-bearing quartz was broken. A similar object was reported in a cave at Kingoodie, England. The metal was found within a block of stone

formed during the Pleistocene Age, dated at about 12,000 years or older.⁶²

Connecticut A copper coin, found in Connecticut in 1843, was described as having similar symbols to those carved on a rock at Grave Creek, West Virginia.⁶³

Virginia Reports from Virginia give one pause. On the Roanoke River near the town of Jeffress, there have been finds of slag. On one site 400 pounds of worked iron were excavated. Other similar sites have been found in Mecklenburg and Brunswick counties. A natural draft furnace used by ironworkers was discovered. At one site a bronze cup, a bronze spindle whorl, and other bronze fragments were found.

Among the worked iron pieces found were a short thrusting sword, small knives, chisels, nails, and headers for making nails. Chemical analysis of the iron revealed that the worked iron was made by the method used by the ancient world, and not the method used in colonial or later times.⁶⁴

Engraved monograms on rocks at one site are similar to those used by early Christians, which suggests a first century A. D. date.⁶⁵

While it would be natural to attribute all such finds to colonial times, the finds were made on virgin land never used by the colonists. If the colonists and the Indians are ruled out, then some very interesting speculations are possible.

Brazil In unexpected places, news of ancient metal working is reported. In the interior of Brazil there are reports of many mines which date back to very ancient times. Mysterious inscriptions on rocks are noted in the Amazon basin which may point to very early contacts by unknown peoples in search of metals.⁶⁶

Mexico The extent of ancient mine workings—pits, shafts, tunnels, stopes, and dumps are astonishing. The Los Cerillos mines in Mexico, for example, included one entire mountain honeycombed by the ancients. Pillars were left to support the roof in the quest for gold and turquoise. The main shaft was 200 feet deep in solid rock with smooth vertical sides cut with great precision.⁶⁷

The Mexicans melted metal in crucibles, cast metal in molds of clay or charcoal, and used the lost art of casting parts of the same object of different metals, for example a fish with alternate scales of gold and silver. Copper and other metals were gilded by a process which would have been the envy of any goldsmith in Europe. Mexicans made birds and animals with movable limbs and wings in a most curious fashion.⁶⁸

Peru Bennett of Yale found evidence in Peru of civilized people who lived 2,000 years before the Inca who smelted ores, welded, and soldered metals. With bronze scalpels they performed trepanning and other forms of surgery.⁶⁹

At Chan Chan, Peru, electroplating was practiced by the pre-Inca Chimú culture. Beautiful artifacts of copper were plated with gold or silver, and silver objects were gold plated.⁷⁰

Tomas reports, as others have done, a number of strange metal finds. In the 16th century Spanish conquistadors found an 18 cm. iron nail solidly encrusted in rock in a Peruvian mine. Since iron was unknown to the Inca, as far as is known, the find was particularly

puzzling. The Spanish Viceroy, Don Francisco de Toledo, kept the nail in his study as a souvenir for many years. The account of this find is contained in a letter dated October 9, 1572, in the Madrid Archives.⁷¹

Venezuela A find of old Roman coins was made on a shore site in Venezuela late in the nineteenth century. Roman and Arabian coins carried dates up to the 8th century A. D. Around 800 A. D. a voyage took place which ended on the coast of South America. Nothing else is known about this event. While authorities scoff at the possibility, Spaniards in the 16th century reported "white" Indians. There is no necessary connection, but there may be one.⁷²

G. The Lure of Copper

Old Copper Culture There are many puzzles about the ancient use of copper in the Great Lakes region and Canada. Dating has been difficult and inconsistent with other developments in America.

Although the sites of the copper mines extend for hundreds of miles along Lake Superior, and the sites show extensive and remarkable engineering, so far there is no indication of any permanent settlement near the mines. Not one dwelling, skeleton, or bone of these ancient people has been found in the area.

Michigan State University archaeologists reported a find of copper-working tools in Ontonagon County of the Upper Peninsula, which were used to shape the Lake Superior copper. The site was tentatively dated at about 3500 B. C.⁷³

Fitting reports two C14 dates of 2700 B. C. and 5500 B. C. for the Oconto site in Wisconsin where stone and copper artifacts were found. Both dates seem too old for what is believed about this culture.⁷⁴ At another Wisconsin site two dates from the same source were 5600 and 7510 B. C. On this basis these people are considered among the oldest metal users in the world.⁷⁵ The dates are embarrassing and perplexing. Perhaps some day a tie will be found with the Old Copper Culture and world-wide navigation before the time of Abraham, rather than somehow attributing all of the copper culture to early American Indians.

Copper artifacts were well-made and included large spear points - some socketed - knives like some Eskimo forms, gouges, adzes, axes, chisels, harpoon heads, awls, and ornaments. Archaeologists are at a loss to find such a well developed metal industry so early in America. In support of very early dates, however, is a find of copper artifacts in an Archaic site in New York.⁷⁶

Far more puzzling and difficult to explain is a find at Thunder Bay, Ontario. A copper spear point was excavated in association with the bones of extinct bison and horses lying on a blue clay deposit covered with 40 feet of cross-bedded sand, yet the human bones there were of modern man.⁷⁷ It hardly need be said that this find wildly contradicts almost everything fondly believed about ancient man.

In prehistoric times the copper of the Upper Peninsula of Michigan was known all over eastern America. It is certain that the deposits were known and in use at the time the Jesuits penetrated this region. Fuller reports that the copper deposits were visited by Indians well into the early part of the 19th century. An aged Chip-

pewa in northern Wisconsin remembered as a youth going with his father to gather copper from the Keweenaw peninsula. Scholars have no clear answer to the fact that while Michigan was the main source of copper, few copper artifacts have been found in that state.⁷⁸

While a scattering of copper artifacts has been found in Michigan, Minnesota, and Wisconsin, no camp site of significance is yet known in these regions. Perhaps the main flow of these artifacts went in other directions.⁷⁹ A campsite was found recently on Allumette Island in the Ottawa River near Pembroke, Ontario. Here and at nearby Morrison Island more than 1200 copper artifacts were discovered. More recently on the St. Lawrence River, 30 miles west of Montreal, copper artifacts have been recovered along with an incised pebble showing a very un-Indian smiling human face.⁸⁰

One strange find was reported in the 1890's at Newberry, Michigan, in the heart of the copper country. An inscribed stone along with three stone images were found. The largest, almost life-size, was of a seated male. The stone tablet measured 18 x 25 x 6 inches and was marked off into 140 squares of about 1½ inches in size. Each square contained an inscribed character, some of which appeared to resemble Phoenician or Cypriot characters. The origin of these stones has never been satisfactorily explained.⁸¹

Another possible link with the Old World is suggested by Dewdney who has found and catalogued numerous rock carvings and paintings in Ontario, carvings on the shores of Fairy Lake in Nova Scotia, and other sites in Wisconsin and Minnesota.⁸² While some of the finds are believed to be quite recent, others may be very old.

A find in Alberta, Canada, is of interest. An Old Copper Culture object was found in the bed of Cator Creek, 80 miles east of the city of Red Deer. It consisted of a copper crescent with prongs at each end.⁸³

Based on almost identical culture patterns of northwestern Europe and northeastern America as early as 7000 B. C., Riley suggests two-way travel across the Atlantic and trade links between the Old Copper Culture and Europe.⁸⁴

Enterline reports a find at Pond Inlet on the northeast corner of Baffin Island which suggests a climate in ancient times different from today. Below old Eskimo deposits, a piece of cast copper alloy was found. In addition there was much evidence of metal blades and weapon heads at this site.⁸⁵

It is interesting that there are several locations in the central Arctic where pure copper appears on the surface of the ground. In this area Jenness reported about 1922 a number of cairns of non-Eskimo construction. The cairns were very similar to those built for landmarks in Scotland. Stefansson reported that some men of a tribe in southwestern Victoria Island wore very typical Scandinavian beards, and one woman possessed the features typical of Scandinavian girls. Perhaps the relationship is to early Viking explorations in Canada, rather than from an earlier time.⁸⁶

Before the time of Abraham, the ancients dug pits in northern Michigan, built bonfires to heat rocks, poured cold water to split the stones, and then beat out the copper with stone hammers. Ten thousand pits were dug

for copper and some estimate that as much as a billion pounds of the metal were produced before about 1000 B. C. when the culture disappeared.

There is some hope that chemical fingerprinting of copper samples can be developed to the point where copper artifacts anywhere in the world can be traced accurately to the mines from which the metal was secured. Perhaps then conjecture can be replaced with fact.⁸⁷

The Mound Builders Somewhere around 3,000 years ago, a remarkable people spread over the Mississippi River valley and its tributaries. There are estimates of 100,000 mounds and other earth constructions built by these people, spread over about two-thirds of the area of the United States. The earthworks were always near water.

Thousands of constructions were made in perfect squares, circles, squares within circles, polygons, ellipses, long lines in exact parallel, sweeping parallel arcs, rhomboids, and perfectly proportioned magnifications of natural shapes. Who these people were and their ties with other parts of the world are questions which have never been satisfactorily answered. Two related cultures have been identified, the Adena, followed about 500 years later in time by the Hopewell.

The Hopewells could turn copper into ear-spools, repousse copper, and overlay it with silver and iron. They found and worked iron meteorites. At a later time than the Hopewells, another people used copper for tools rather than for ornaments.⁸⁸

Cahokia, just to the east of St. Louis, was the largest pre-Columbian town in the United States and spread over five square miles. The vast trade network of this cultural center extended as far as Florida, the Appalachians, and the Lake Superior region where copper was secured.⁸⁹

In some of the mounds surprising finds were made. The artifacts predate the coming of Europeans to America.

In a site named the Mallon Mound F, copper pan pipes were found.⁹⁰ In the Abbott Farm Site near Trenton, New Jersey, which predates the mound builders, a copper rod, 14 inches long, with an eye in one end, was excavated. No one yet can conceive of the purpose for which this artifact was made.⁹¹ Macgowan reports a copper relic found in 1880 in a mound which has an elephant in harness engraved on it.⁹² In the mounds of Ohio, copper axes weighing as much as 23 pounds were found. Copper breastplates and headdresses were cut from heated and hammered sheets.⁹³

Donnelly reports that mound builders in America understood the art of casting metals, or associated with those who did. A copper axe cast was found in New York, and in the Mississippi valley various articles plainly show marks of a cast mold. In a mound at Marietta, Ohio, Hildreth found large circular ornaments of copper overlaid with a thick plate of silver. Copper tubes were also found. According to Squier, an early explorer of the mounds of America, copper bosses were found plated, not simply overlaid, with silver.⁹⁴

Among the many strange finds from the Spiro Mound on the bank of the Arkansas River near Spiro, Oklahoma, were small masks carved from wood and over-

laid with copper, cloth woven from bison, and rabbit hair thread.⁹⁵ Mounds were excavated in the state of Washington, and one of the artifacts was an armored coat consisting of small pieces of copper tubing.⁹⁶ In 1891 there was a report in *Nature* of a giant skeleton found in an Ohio mound. With the skeleton was copper armor.⁹⁷

Poverty Point, Louisiana, is amazing. The enormous construction dates back to about 1500 B. C., many centuries before any other known mound building in the United States, except for satellite settlements within a radius around Poverty Point. A complex of six concentric octagons was built, the outermost almost $\frac{3}{4}$ th mile across. The amount of earth used in the project was 35 times the volume of the enormous Cheops pyramid in Egypt.

Among the finds were copper and iron ore from the Great Lakes region, and galena (lead ore) from Missouri. These and other remains and artifacts show that the people of Poverty Point had a trade network along the waterways in all directions up to 3000 miles long. The site was suddenly abandoned. No one knows why.⁹⁸

Greece As excavations continue around the world, many more surprises may be expected. A site of unusual interest was reported from the Province of Drama in Macedonia in 1969. Carbonized grape pits were tentatively identified as dating to about 4000 B. C., but house floors and other artifacts were considered a thousand years earlier. Pottery was well-preserved.

Here was found the earliest metal so far in Greece and consisted of simple copper pins, fishhooks, and beads. Slag at the site showed that the copper was extracted there from ore, an astonishing degree of sophistication for that time. Archaeologists puzzle over a curious four-legged ceramic object painted black on a red background. The animal depicted has a hump on its back and most resembles a camel.⁹⁹

Europe Elsewhere in Europe the story of copper is better known. At a very early time people came to Denmark from the sea. Artifacts recovered there include copper axes, spiral armlets, daggers, saws, curious tanged arrowheads, and objects of gold. Amber, ivory, and stone carvings were also found.¹⁰⁰

A stream of prospectors, traders, colonists, metalworkers, and bearers of a new religion moved over much of the world. In the graves of south France were fine flint copies of copper daggers. The stone axes in Breton are ritual copies of metal axes. For reasons not at all clear, the metal workers buried stone copies of their work. Some argue that the very ancient ships of these times survive today in modern vessels, and point to the Portuguese saveiros as a possible example. While little is known of these ancient sea people, it seems certain that they did not speak an Indo-European language.¹⁰¹

Iran Many authorities would agree that the Iranian Highlands is where metallurgy probably began. From this fascinating region, where many discoveries will still be made in the future by archaeologists, metallurgy spread to many parts of the world. It is interesting that near the famous site of Tepe Sialk, one of the oldest villages known, lie large deposits of pure copper. At

Tepe Sialk some of the oldest, if not the oldest, copper tools have been found.¹⁰²

Day disagrees. In his overview of the history of man, Day concludes that the earliest metal artifacts are beads and pins of beaten copper which date to about 4000 B. C., and which were found in Egypt.¹⁰³ Such statements have a very short life in the literature of archaeology.

In the shadow of Iran's Zagros Mountains is the Great Sand Desert, Dasht-i-Lut, where no man can live among the howling sandstorms. A new discovery was reported in 1973. At the desert edge evidence of a great and flourishing town was found which may predate Tepe Sialk and the finds in Egypt. Among highly artistic artifacts found were copper vessels, axes, nails, and pins. Two metal plates were engraved with fish and deer. A metal flag attached to a staff was adorned by an eagle in XXth century A. D. style. A sudden disaster destroyed the city.¹⁰⁴

Austria There were copper mines in Austria during the Late Bronze Age, and possibly earlier. In the alpine regions of southeastern Austria, near Prein, some smelting places have been discovered. The most interesting finds here were earthen vessels which were obviously parts of bellows similar to those still in use by African tribes today.

This illustrates the high probability of one original center where the Old Ones taught all those who used the technology before they spread out around the world. Despite all the catastrophes of history, the find also shows the astonishing continuity over the centuries of skills that have been learned.¹⁰⁵

H. The Puzzle of Bronze

Depending on which authority is read, the Bronze Age is said to have begun about 3150 B. C. At this time the use of bronze, a mixture of copper and tin, was common in Mesopotamia. Users of bronze soon after were swarming into Europe and the British Isles. Swords, shields, buckles, pins, and many other artifacts of this ancient time show great artistic skill.¹⁰⁶

Tomas notes that copper was well known in Sinai, Crete, Cyprus, Spain, and Portugal, but tin was rare and found in Etruria, Gaul, Spain, Cornwall, and Bohemia. Sea transportation was a necessity. The similarity of bronze tools around the world suggests that all the technology came from one source. Bronze appeared suddenly in Central and South America.¹⁰⁷

Ancient burials in Hungary and northern Europe contain only copper. Yet burials of similar age in southeastern Spain contain artifacts of both copper and bronze together. With these burials are carnelian beads of foreign origin, possibly from India. This suggests very early deep sea navigation by the teachers of metallurgy. Old Chinese records speak of tin brought from an area to the northwest of China for their bronzes.

The Egyptians, Greeks, Etruscans, and Romans used lead and copper to make a form of bronze. Egypt used flint, bronze, and iron simultaneously. In southern Italy bronze daggers were found identical with Egyptian forms. In all of Europe bronze implements are everywhere nearly identical in form with only minor

peculiarities in each region. The Semitics have no tradition without the use of metals. In India, before the time of the Aryan invasion, bronze which included ten percent of tin was identical with bronzes everywhere else.¹⁰⁸

In speaking of world ages, each of which ended in destruction, Hesiod, 8th Century B. C., lends some support to conventional thinking about the metal ages. He speaks of the third world age of bronze. Then the earth was repopled by those who used both bronze and iron, which was the time of the Trojan War. After another destruction the next generation used iron.¹⁰⁹

Other evidence contradicts this view or at the least complicates it.

Over and over the conclusion must be faced that world-wide use of bronze stemmed from one original source, and the rapid diffusion of this technology eloquently speaks for skilled navigation. The possibility must be considered that China was receiving the same stimulus for bronze-making as was Europe and Africa.¹¹⁰ Yet historical records are not yet adequate to give a clear picture of who these people were.

Many discoveries as well as finds still to be made have not yet been fitted into a coherent world-wide pattern. In northeastern Thailand and near the city of Saigon, two-piece socketed tools of bronze have been found, tentatively dated at 2500 B. C.¹¹¹ Ancient times emerge as filled with enormous energy, enterprise, and sophistication.

At Tepe Yahya in Iran bronze tools containing arsenic have been dated at about 3500 B. C. Who taught the bronze makers?¹¹² Primitive man does not chip flints one day and then decide to go out and make some bronze tools the next day.

Ancient bronzes are not usually associated with the United States. Yet a few scattered finds have been reported. A bronze dagger was found at Merrimackport, Massachusetts; a bronze spearpoint near Brentwood, New Hampshire; a bronze shield near Windham, New Hampshire; and bronze artifacts near North Salem, New Hampshire, the site of mysterious megalithic structures.¹¹³

Arctic Region Before a sudden change in climate there was an advanced civilization in northeast Siberia to the shores of the Arctic Ocean. Abundant cultural remains have been found by Russian archaeologists in this frozen Taiga country. The cultures represent the so-called paleolithic, neolithic and bronze periods. Rock carvings, the same in style as those in the caves of France and Spain were found in the Lena river valley near the village of Shishkino.

Also on the Lena, inside the Arctic circle, stone monuments were discovered. Outstanding finds have been made near Lake Yolba, and in Yakutsk a workshop of metallurgists was found for making bronze axes similar to those of the Near East and in Europe. The ancients of northeastern Siberia could extract copper from ore, melt and pour it in forms. They made axes, beautiful bronze spear tips, knives, and swords.¹¹⁴

There are many surprises in the Far East. The Koreans were the first to use cast type blocks of bronze for printing.¹¹⁵

There were two periods of the Lake Dwellers in Scandinavia, Germany, Switzerland, and northern Italy, each ending in a terrible disaster. During the second period of time, bronze objects were in common use and have been found in great numbers. The roads through Alpine passes were much travelled during the Bronze Age with many artifacts found along these roads, especially on St. Bernard. Mines were also worked in the Alps at this time. Then there was a sudden event, the mines were abandoned, and for a long period of time the passes were no longer travelled.¹¹⁶

It is not considered nice to find the wrong thing in the wrong place. In 1867 a bronze bell was found on North Island in New Zealand. Many centuries before it was probably cast in Java and was of Hindu origin. Other objects of silver and glass were uncovered, but the finders feared ridicule and therefore did not report the finds immediately. Long before the Maoris came to New Zealand a high civilization was founded on these islands. As evidence there are many old terraces with stone walls, enclosures, and other stone structures which predate Maori times.¹¹⁷

The Bronze Culture in China was thought to have begun in the Yellow River valley. More recently a Bronze Culture has been found in South China which is a thousand years older than the earliest finds along the Yellow River.¹¹⁸

Little is known about the early Harappan Culture which lived in a vast area around the Indus River in India. As is true elsewhere, there was no Pre-Harappan Culture. The culture was mature and sophisticated from the outset. Already in the first period beads of gold sheet with tubular perforations were found. In the second period copper and bronze rods were found along with many beautifully worked artifacts of many kinds.¹¹⁹

Turkey from very ancient times shows strong Asiatic kinship, but no one has yet been very successful in sorting out the many cultures of this great land. The Hattians, who were forerunners of the Hittites, dropped in from nowhere and vanished into nowhere. The Hattians were highly skilled in depicting animal life in bronze figurines. This high skill also flourished in the Russian steppes at the same time, but no clear connection has yet been established.

The Hattians produced carefully polished jugs, jewelry, and gold cups of great delicacy and sophistication. If they had a written language, it was written on materials which soon decayed. The Hattians made geometric perforated metal disks or bronze bulls and stags for ritual use. Some of these were meticulously inlaid with precious metals. The Hittites who succeeded the Hattians were also noted for their work in metal and they are usually credited with triggering the Iron Age.¹²⁰ As with almost everything, things are not quite that simple.

On the shores of Lake Sevan in the mountains of Armenia northeast of Mt. Ararat some exceptionally rich finds have been reported in 1973. Dating back to about 3000 B. C. were ceramics, utensils, jewelry, wagons, and a unique find of chariots with spoked wheels. Extensive gold mining was important at that time.

Gold and bronze buttons, studded with gems, were found. A possible tie to the Hattians, or at least some common thread, was the find of many types of exquisitely formed miniatures in gold. Ceramics were decorated with pictures of ostriches. Oxen, deer, lions, goats, birds, and frogs were depicted in bronze. Some of the decorations involve graining and lines so fine they can hardly be seen by the naked eye.¹²¹

Mexican archaeologists reported the find of a bronze axe head on the island of Cozumel in 1972. Since bronze was never used by the Maya, it was an unusual find. Chemical analysis led to the conclusion that the copper in the artifact was from the Western Mediterranean area.¹²²

Important Questions Instead of a lockstep so-called Bronze Age, the more important questions seem to be: How much had a given people in a given area of the world been taught by the Old Ones and their descendants? What were the resources of the people where they lived and from trade with other parts of the world? What catastrophic events affected the lives and the technology of the people in an area? The answers to these questions determine whether or not a given people ever had a Bronze Age or not, and has little to do with a chronology.

Among the puzzles involving bronze in the New World are a number of finds of coins and other artifacts.

Around 1890 nine skeletons, two brass bracelets, a copper bead and other artifacts were excavated by an archaeologist at Bat Creek, Loudon County, Tennessee. Only recently has the inscription been deciphered and found to be Hebrew.¹²³

Copper, iron, and brass were found in the skeleton of an old ship uncovered from the sands at Manasquan, New Jersey. These remains appear to be from an old Viking ship.

At the Falls of the Ohio near Louisville, Kentucky, skeletons and brass-plated shields were uncovered. The shields bore a Welsh coat of arms, and there are traditions and stories in that area of white Indians who spoke Welsh. Some scholars attribute these finds and other evidence to a Welsh expedition to America in the twelfth century A. D.¹²⁴

Workmen boring a well near Norfolk, Virginia, in 1833 brought up an ancient coin at a depth of about 30 feet. The coin was oval-shaped, about shilling sized, and stamped with figures representing hunters or warriors. Those who studied the find compared the figures with similar ones of ancient Rome, but no definite identification could be made.¹²⁵

Farther to the south, a coin was found near Buttons, North Carolina in 1954 which bore the numerals 1215, presumably a date. The characters on the coin appeared to be Arabic.¹²⁶ It is not possible to say whether the coin represents an early voyage to America or whether it was lost by someone in recent times.

An old Syrian bronze coin, dating to the time of Antiochus IV, about 170 B. C., was picked up on a farm in Cass County, Illinois in 1882. Again no definite conclusion could be drawn from the find reported in the *Scientific American*.¹²⁷ Another Illinois find is much more difficult to explain. In 1871 near Chillicothe

drillers brought up a bronze coin from a depth of about 120 feet. If the find is indeed authentic, a great deal of geological change took place in a very short period of time since coins were not known before about 700 B. C. The discovery was reported in the Proceedings of the American Philosophical Society.¹²⁸

Twenty years earlier in Whiteside County, Illinois, the bit of a well driller brought up two copper artifacts from sand at 120 feet. One of the objects was shaped like a boat hook, and the other was a copper ring.¹²⁹

A Roman coin was reported found in an Illinois mound in 1913 and was identified by Dr. Emerson of the Art Institute, Chicago, as a rare mintage of Domitius Domitianus, Emperor in Egypt.¹³⁰ There is no way all the reported finds can be authenticated, but the suggestion is strong that transoceanic travel was not at all uncommon in the past.

A remarkable find was reported in British Columbia in 1882 from the bank of a creek in the mining district of Cassiar. At a depth from the surface of only several feet, 30 brass coins strung on an iron wire were uncovered. The wire deteriorated almost immediately, but the coins were in very good condition. According to Chinese in Victoria who examined the find, the symbols on the coins dated back to about 1200 B. C.¹³¹ While it is known that the Chinese used coins before 700 B. C., it is not known how accurate the dating is on the coins found in Canada. There are, however, many evidences of very early Chinese contacts with America.

I. The Mystique of Iron

According to Archaeologist Schaeffer, more contradictory statements have been made about iron by scholars than any other metal. It is possible that some day proof will emerge that an Iron Age preceded a Bronze Age in Egypt.¹³²

Iron, usually attributed to a meteoric origin, is known to have been used in predynastic Egypt for making beads. Smelting of iron ore for tools, weapons, and other artifacts is generally dated back to about 1300 or 1400 B. C. Iron became common in western Europe about 500 B. C.¹³³ The story of iron, however, may not be that simple.

During the Old Kingdom in Egypt, long before the Iron Age, sharp, finely cut lines were cut into granite, basalt, and into diorite, the steely stone, the hardest of them all. All of this work indicates that a steel-hard medium was used to cut the stone. At Gerzah, 50 miles south of Cairo, iron beads were found at a predynastic site. An iron chisel was found between the stones of the Great Pyramid of the fourth dynasty, and a number of chisels and other iron tools were found in Saqqara near Cairo.

Pieces from a pickax were unearthed at Abusir and a heap of broken iron tools from the same period was found at Dahshur. An iron wedge was found at Abydos. These sites were all from the sixth dynasty, which again long predate the iron age. Most of these artifacts show a nickel content and are probably meteoric iron. One or two iron objects from the sixth dynasty, however, contain no nickel. The conclusion is that iron smelting was known in the Old Kingdom, many centuries before the Hittites began the so-called Iron Age.¹³⁴

Through catastrophes this knowledge was lost for many centuries. At a much later date we have a letter from Rameses II calling for a shipment of the highly prized wonder metal iron, which was at that time a Hittite monopoly.¹³⁵

While it has been fashionable to date events of the Old Testament as late as possible, the correct chronology shows that iron was well known centuries before the Iron Age began. Without including references to iron before the Flood, we note such accounts as Og, King of Bashan, who had an iron bed. There were iron vessels at Jericho. The Canaanites used iron chariots.

Archaeologists found iron axes or hoes sealed in a water passage at Gezer 400 to 500 years before iron came into general use in Palestine if we follow conventional chronology. In the immortal words of the archaeologist, these finds are "not easily explained".¹³⁶ Long before the Iron Age, a bow of steel is mentioned in the book of Job. The root word used means to shine, and steel is required by the sense of the statement.¹³⁷

Iron in Europe Donnelly alludes to an iron age in northern Europe which far predates any contact with Greece or Rome. Accounts have come down that in very ancient times the Peruvian rulers worked magnificent iron mines at Ancoriamas on the west shore of Lake Titicaca.¹³⁸ This information is difficult to evaluate but the puzzling iron nail found in Peru by the Spanish has never been satisfactorily explained.

While the Hittites are generally credited with the first iron smelting, the oldest iron mining known in the Mediterranean area is on the island of Elba where the Pelasgians are believed to have worked. Excavations here revealed huge subterranean canals which had been blocked, perhaps by some catastrophic force, thousands of years before Christ.¹³⁹

In 1930 a report was published in *Nature* that an iron foundry, slag, and ashes were found with Paleolithic materials in a cave at Mumbwa, Northern Rhodesia. The material may date as far back as 2000 B. C., but since this would predate the Iron Age by many centuries critics attempt to attribute the find to Arabs c. 1200-1900 A. D. The radical difference in dating illustrates the problem of solving mysteries of the ancient past.¹⁴⁰

Perry described the many ancient remains of India. At Kupgal Hill, Bellary District, in central India, there were many ancient hilltop settlements. The Iron Age here followed hard on the Neolithic if any distinction at all can be made. Iron slag and Neolithic tools occur together at the same sites. At Chota Nagpur there are remains of smelting places and iron slag, ornaments, copper vessels and implements, brick foundations, stone beads, and copper celts. There is no support here for the neat arrangement of stone and metal ages.¹⁴¹

The Bomvu Ridge in Swaziland in southern Africa includes a peak which consists of an estimated 48 million tons of high grade iron ore (Haematite). This area is covered with tens of thousands of stone implements and honeycombed with ancient pits. Red ochre was used all around the world for cosmetics and for rituals and burials, and perhaps this was the purpose of the mining at this site.¹⁴²

In southwestern Azarbayjan many ancient sites have been excavated and metal objects of bronze, silver, and gold were found. But at one early site iron slag and an iron finger ring were found. The iron slag is called "alleged" iron slag because it was not supposed to be there. The site is also given a late date because of the iron, but perhaps iron working is older than archaeologists think.¹⁴³ It seems very curious to say "alleged" iron slag. In the modern scientific age it ought to be very simple to test the material and confirm that the substance either is or is not. No one wants to disturb the fixed chronology of the Iron Age. Whatever is found must fit into the established structure.

An immensely complicating factor in the consideration of the role of iron in ancient life is the shroud of mystery and superstition which covers this metal unlike any other. Undoubtedly the fall of iron meteorites contributed to the feelings of the ancients about iron, but the problem seems much deeper than this one factor.

Iron meteorites were venerated in many ancient temples, for example, in the temple of Astarte at Tyre, in the temple of Amon at Thebes, at Delphi, in Mexico, and of course the sacred black stone of Mecca.¹⁴⁴ Similarly an ancient relic was passed down among the Malay kings. This was the Sacred Lump of Iron which became part of the regalia of the rulers. The lump was regarded with the most extraordinary reverence mingled with superstitious terror. In the Celebes iron was much used in magic rites.¹⁴⁵

Tabus about Iron Frazer reviews the tabus about iron. To many peoples objects made of iron were especially noxious and dangerous. Roman and Sabine priests could not be shaved with a iron implement, but only with bronze razors or shears. Whenever an iron graving-tool was brought into the sacred grove in Rome for cutting inscriptions in stone, a sacrifice of a lamb and a pig had to be offered. The same rite was repeated when the tool was again taken from the grove.

As a general rule iron could not be brought into Greek sanctuaries. On Crete sacrifices could not involve the use of iron in any way. The Hottentots today never use an iron knife for sacrifices or circumcision. In southwest Africa iron could be used for the operation, but only if the iron knife was then safely buried. In Yap of the Caroline Islands, wood for the fire-drill could not be cut with iron or steel. The men who made the need-fire in Scotland first had to remove all metal from their persons.

Another old belief was later applied to Good Friday, that on no account whatever should iron be put in the ground on that day. Iron was forbidden in Scottish divination ceremonies. In India an old tabu affected a highly educated Hindu Rajah who would not allow iron to be used in any building on his land. His belief was that great evil would follow if the tabu were violated. The Baduwis of Java today will use no iron tools in tilling. Iron there is used as a charm for banning ghosts and spirits. The Toradyas of Central Celebes are very careful not to put iron in a coffin. They think the dead may throw it out, and also think that iron falling on the fields might blast the rice crops.¹⁴⁶

To the ancients iron was evil, but the poets forgot why. The recital of the origin of iron may have been in-

comprehensible to the poet, yet he knew he had to recite this "deep origin" to control the deadly powers of cold iron. Magic and divination were always present in the grim business of the smith in ancient literature. Aristotle refers respectfully to the grave testimony of the ancient poets. The earliest writers behave like worried and doubting commentators. They always try to explain a dimly understood tradition. They use old words whose meaning is half lost to them.¹⁴⁷

Some early event having to do with iron left a searing, horrifying memory in mankind which is dimly recorded in ancient writings and in customs which have come down to the present day. Some writers hint at what this event may have been.

If the moon and the planets were bombarded by such a swarm of huge meteors, then the earth also underwent the same catastrophic bombardment at the same time. The evidence that this really happened is all around, and researchers are only beginning to recognize it for what it really is. The asteroid belt which orbits about where a planet ought to exist has led to the theory of a planet that had been torn apart. The jagged fragments were torn away violently and some of them now rotate on their longer axis.

These evidences indicate a violent separation from a parent body. Satellite photos show mountain-size lumps embedded in the earth up to several hundred miles in depth. Perhaps many of our iron and nickel deposits fell to the earth in a great catastrophic event.¹⁴⁸ There are wildly different estimates of the time when enormous meteorites struck the earth. The evidence of the poets and customs around the world support the idea that this event happened early in man's history.

Campo del Cielo, the Field of Heaven, in Argentina is an example of a great cosmic body which crashed into the earth. Scientists from the Lamont Observatory at Columbia University reported the find in 1965. Nine large depressions in the earth were found close together, and another was located 75 miles away. Great masses of iron were found. The scientists suggest a date of about 4000 B. C. for this event. While there is no clue as to the nature of the cosmic body, it was suggested that it may have been as large as the moon.¹⁴⁹

Other Iron Finds A strange and unexplainable find was reported at the Shefferville Mine in Ontario in 1956. Modern-appearing wood, some charred by heat, as well as fossil-appearing wood, dated by C14 at about 2000 B. C., was recovered from iron ore at depths in the mine of several hundred feet. The deposit of ore was considered to be Precambrian. The wood was later described as late Cretaceous rubble, but the chief mine geologist could find no explanation for the occurrence of the wood and iron ore together.¹⁵⁰ Iron ore dumped on the earth could cover vegetation as described, but not enough information is available to pursue the possibility at this time.

It is difficult to know what to do with reports such as those which follow. Each one has been reported as true, and so they are given a hearing. If any are fraudulent they should be exposed as such. If even one of them is true, we have much to ponder.

The Shawanoes, an Algonquin tribe, have a tradition of a foreign origin and of a landing from a sea voyage to

western Florida. In the early nineteenth century they still made yearly sacrifices in memory of their safe arrival. According to their tradition white men lived in Florida long before colonial times, and these people had iron tools. The old Shawanoes passed on memories of earth-covered tree stumps where the trees had been cut down by metal-edged tools.¹⁵¹

A pin was reported in a lump of coal by Ellie Booth, Boise, Idaho. Hiram DeWitt, Springfield, Massachusetts, brought a fist-sized piece of auriferous quartz from California. It was accidentally dropped and split open. Inside was a cut-iron nail, 6-penny sized, slightly corroded, but straight with a perfect head. If that find was authentic, other finds made in Nevada may help to explain the matter. The *Carson Appeal* reported that quartz crystals had been found in a mine which could have had only fifteen years in which to form.

At another location a mill had been built and then torn down twelve years later. During these years sandstone had formed, for in the sandstone was a piece of wood with a nail in it. Near Treasure City, Nevada, a fist-sized piece of feldspar was taken from the Abbey mine, November, 1869. Firmly embedded in it was a metal screw about two inches long. Its taper was as clearly visible as was the regular pitch of the threads. Oxidized iron filled the cavity. The specimen was sent off to an academy in San Francisco where it was quietly forgotten. In Sullivan County, Missouri, 1879, a farmer found an old ritual mask made of iron and silver.¹⁵²

In a report from a mine in Scotland, an iron instrument had been found inside a piece of coal, seven feet under the surface of the earth. The instrument appeared to be modern, yet there was no sign of boring into the coal. A nail was found in a block of stone from Kindgoodie Quarry, North Britain. The block of stone was eight inches thick and came from below the surface. The point of the nail projected into some till and was eaten with rust, but the last inch, including the head, was embedded in the stone.¹⁵³

The Kutb Minar iron pillar is found in Delhi, India. It weighs six tons and is about 24 feet high. It is usually dated to about 415 A. D. A forgotten technology was used for the task of forging so large a pillar. Even more surprising is the fact that after 15 centuries there is no evidence of rust on the pillar.¹⁵⁴

At Kottenforst, west of Bonn, West Germany, is an old iron column called the Iron Man. It extends about five feet out of the ground, and is supposed to continue for 90 feet into the ground. No rust appears on the iron and nothing is apparently known about who made it or when it was made.¹⁵⁵

Photos and affidavits were made in 1912 to confirm the report of an iron pot found in a lump of coal at Thomas, Oklahoma. When the coal was broken up in the Municipal Electric Plant, the iron pot fell from the center leaving its impression or mold in the coal. The source of the coal was the Wilburton, Oklahoma, coal mines.¹⁵⁶

An account from Yucatan was written by a Spanish bishop in 1550. Near Merida strange buildings were found quite unlike any others on the peninsula. Stone roofs were held in place by iron rods, but the construction long preceded the coming of the Spaniards.¹⁵⁷

An iron ax and copper breastplate were found in a mound in Wayne County, Ohio, in 1889. The mound-builders long predate European colonies in America, and thus it is assumed that the iron ax represented a recent burial in the old mound.¹⁵⁸ Mallery, in his book *Lost America*, developed the theory that an Iron Age Civilization existed in America prior to Columbus. He supported his position with photographs, radiocarbon dates, and microscopic and metallurgical analyses. No one has taken this theory seriously since it does not fit what is believed about the early history of America.¹⁵⁹ Enough strange iron finds have been made, however, that serious scholars ought to evaluate his evidence.

J. Things of Silver and Gold

There is really no conventional way to explain some reported finds, unless they are frauds. In 1891 Mrs. S. W. Culp, Morrisonville, Illinois, broke apart a chunk of coal near her stove. Inside was a neatly coiled gold chain ten inches long. The metal was tested and found to be 8-carat gold. The ends of the chain remained attached to coal fragments.¹⁶⁰ Near Tweeders below Rutherford Mills, England, workmen quarrying rock discovered a gold thread embedded in stone at a depth of 8 feet. A piece of the thread was sent to the office of the *Kelso Chronicle*.¹⁶¹

In 1851 the *Scientific American* reported on blasting in a quarry near Dorchester, Massachusetts. Embedded in solid rock was a bell-shaped metal vessel which contained floral designs inlaid with silver. In the State Hermitage Museum at Leningrad, U.S.S.R., a golden buckle of Scythian origin is on display. The problem is that the buckle shows the image of a sabre-tooth tiger on it. According to conventional dating these animals were extinct many thousands of years before the Scythians entered into history.¹⁶²

In a Smithsonian Report, 1881, Charles Jones reported the find of a pair of tiny silver crosses found in Georgia, skillfully made, each arm of the cross being of equal length and engraved with Roman letters. No attempt was made to interpret the find.¹⁶³

Among the evidences for ancient mining in California are the following. A mortar was found under volcanic matter at a depth of 150 feet at San Andreas. A triangular hatchet of stone with a drilled hole for the handle was found 75 feet below the surface in gold-bearing gravel and under basalt 300 feet from a tunnel mouth at Table Mountain in Tuolumne County. A human skeleton was found in a clay deposit at a depth of 38 feet at Placerville. A large number of stone mortars, pestles, and stone dishes were found at Murphy's in Tuolumne County.

In this high barren mountain district of California the site of an old mine was discovered. A shaft 210 feet deep was found with human bones at its bottom. Here also was found an altar for worship and other artifacts.¹⁶⁴

In other gold diggings numerous stone relics, mortars, grooved disks, and other artifacts were reported at various depths. Granite mortars and dishes were uncovered of perfect form which weighed up to forty pounds. A lava vessel, hard as iron, was circular in form and had three legs and a beautifully formed spout.

Almost without exception, these ancient artifacts were in or near gold bearing rock or gravel.¹⁶⁵

An astounding number of ancient gold workings have been found around the world. The Malay Peninsula is just one example. In the Tui Valley immense gold-mines were worked by the ancients. One ancient mine, Selensing, was especially astonishing. The low hills are honey-combed for many miles with perpendicular shafts, circular in shape down to water level, and from 100 to 160 feet deep. The method of mining was radically different from that practiced by the Chinese or Malay. There is no clue as to who worked these mines. The mining stopped suddenly at an ancient time and was never resumed.¹⁶⁶

In the Bible a gold land is named Ophir, and most scholars identify the name with some location on the Arabian peninsula. Solomon's fleets sailed there. In 1571 a Spanish scholar, Arias Montanus, published a world map of biblical lands. It is very surprising that he indicated Ophir in two places on the map: on the Andean coast of South America and in the Rocky Mountain coast of North America. Gold in the latter place was not known until 1849, almost 300 years after the map was published. Gordon suggests a very ancient map tradition carried down over many centuries, an intriguing possibility.¹⁶⁷

A massive gold sphere is in the treasure chamber of Maria Auxiliadora, Ecuador. The negative in stone of this same sphere is in the Turkish Museum in Istanbul, and was presumably found in the eastern Mediterranean.¹⁶⁸

Benvenuto Cellini, an artistic genius of the 16th century, spent weeks trying and failing to duplicate an Aztec fish of flexible silver plates inlaid with gold. The goldsmiths of America possessed an amazing level of technical skill.¹⁶⁹ Copper items at Chan-Chan in Chimú, Peru, are plated with gold; and other ornaments, masks, and beads are silver plated.¹⁷⁰ Just as Egyptian vases were covered with a thin layer of gold by an electrolytic process, the same process was used in South America.¹⁷¹

Ancient voyages to America from the Eastern Mediterranean are accepted by more and more scholars. Heine-Geldern suggests the same from India, Indochina, and China at an early date, and gold was one of the chief attractions.¹⁷²

The use of gold in the ancient civilizations of the Middle East is well known from the most ancient times. Already in the First Dynasty plaques of gold and precious stones, necklaces of gold beads engraved with geometric patterns or shaped like snail shells, gold amulets of the bull and oryx, and gold capsules in the form of a cockroach inlaid with emblems were known, despite the fact that only a tiny amount survived the grave robbers over the centuries.¹⁷³

Also from the Old Kingdom vases, knives, razors, and a manicure set, all of gold, were found.¹⁷⁴ Similarly at Ur a cone-shaped gold container was found which contained a set of little toilet instruments: tweezers, lancet, and pencil. Such beautiful art had never been suspected at that ancient time.¹⁷⁵

Contemporary with the old civilizations of the East was the civilization of the Muyu Moqo people in the

south-central highlands of Peru. Jewelry was fashioned from gold and lapis lazuli. The gold foil was so thin that archaeologists were unable to measure its thickness with the equipment they had at hand. These ancients knew the process of annealing. The gold of that area contained a 10 percent silver impurity, and thin hammering was not possible without annealing.¹⁷⁶

In the Museum of the American Indian in New York there are tiny gold beads elaborately engraved or chased, some welded together and pierced, and smaller than a pin head. It does not seem possible that this work could have been done without a lens.¹⁷⁷

K. Other Metals

What does one make of the extraordinary human skull (Rhodesian Man) found in a cave at Broken Hill in 1921? Sixty feet below the ground the skull was found within a mass of soft lead ore.¹⁷⁸

Ornaments of molten platinum have been found in Ecuador. Bits of platinum have also been found among the mighty ruins of the island of Temuen in the Caroline Island group.¹⁷⁹ A temperature of 1769 degrees centigrade is needed to melt this metal. In modern times this temperature was achieved only two centuries ago.

The strangest find of all is reported at Yungjen, China, from the tomb of a Chinese general, Chow Chu, 265-316 A. D. A metal girdle was found which consisted of 10 percent copper, 5 percent manganese, and 85 percent aluminum. Yet aluminum was developed for the first time by Oersted in 1825.¹⁸⁰

When the tin-bearing gravels of Cornwall were reworked for tin and gold, relics of the Old Ones were found, including many stone bowls, mortars, and dishes, mostly of granite. The great similarity between these vessels and those found deeply buried in the gold-bearing gravels of California was noted¹⁸¹ already in 1881. One culture spread over the world at a very ancient time.

Dartmoor, England, illustrates the total obsession of ancient man with metals; and while this place is unique in many ways, there are thousands of similar old exploited areas all over the world. Dartmoor is 365 square miles of tundra-like country in South Devon, lying to the northeast of Plymouth, England. The area is full of ancient tin mines to satisfy the ancient demand for bronze. There are ancient cut stones that formed cairns, burial vaults, and other ancient monuments: hut circles, stone rows, menhirs, hill forts. The earliest structures go back to about 3000 B. C.

The world's longest stone row is found here extending for two miles across the moor in the Erme River Valley. Abandoned for many centuries, tin was rediscovered here about 1150 A. D., but almost 150 years earlier the wild ponies which still roam the moors were reported. Hence they are a legacy from very ancient times.¹⁸²

The trade in tin from Cornwall across France to Marseilles seems to have followed a track coinciding with the line of the ancient dolmen builders. The world-wide extent of ancient mining associated with megalithic monuments is shown by the fact that erecting huge stones is still practiced by a hill tribe in India, and in Japan and North Africa until quite recently.¹⁸³

In their lust for silver, the early Romans smelted a byproduct of 400 tons of lead for each ton of silver. The death rate among slaves who did the mining and smelting was high. Lead was used by the Romans for roof sheathing, cooking, and wine vessels. Democritus gave the helpful hint that the acidity of wine could be reduced by the addition of lead oxide, and Pliny the Elder specified that lead pots must be used in making grape syrup instead of old-fashioned bronze ones.

Lead was generously used for water pipes, cups, sieves, cosmetics, external medicines, and paint. Only the well-to-do could afford all the lead luxuries; and the Roman aristocracy reaped a rich harvest in illness, death, sterility, miscarriages, and still births. A whole class of people of a great civilization was poisoned out of existence.¹⁸⁴

Lead and the Romans are again associated in a strange account from Los Lunas, near Albuquerque, New Mexico. At this site along the Rio Grande River is an old inscription rock said to contain the ten commandments in Phoenician and dated about 880 A. D. Near the site were found lead crosses, short swords, and lance heads, all covered with a heavy, old concretion. In bad Latin an inscription told of a group which had come to this land to escape persecution. Also in New Mexico, Roman coins were found in a cave in the Cook Mountains.¹⁸⁵

In closing the subject of man and metals mention should be made of two related finds in the United States. The Hopi Indians of northeastern Arizona discovered the value of coal about the same time as the English in the 9th century A. D. It staggers the mind to read a Harvard study that more than 100,000 tons of coal were mined in the Jeddito Valley by the Indians. It is strange that the use of coal died out after the arrival of the Spanish to that area. Most of the coal was used for fuel in the homes, but coal was also extensively used for firing pottery.¹⁸⁶

There is evidence that Indians used primitive drilling methods to secure crude oil at sites in Pennsylvania, at Enneskillen, Canada, and at Mecca and Grafton, Ohio.¹⁸⁷

L. An Afterword

The person who has read the usual accounts of the stone and metal ages in conventional works will welcome these many interesting facts gleaned from a variety of books and journals which tell a different story of the past.

More important, the pattern and chronology one finds in the literature of ancient history, anthropology, archaeology, and other works are based on several questionable assumptions. Hence only a very superficial and erroneous view is given of man's past. Certainly there is no need to be impressed with the truth of conventional explanations. A great deal of evidence contradicts such a view of human history.

Unusual sources have been consulted in this paper because they contain facts or alleged facts which are not found in conventional sources. With the story of the past so confused in much literature today, no potential

source should be overlooked in the search to unravel at least some of the puzzles. Further investigation may help to verify or expose assertions found in such unusual references.

Most interesting of all is the fact that if one takes the Old Testament seriously, one finds a framework of history presented which is supported by a broad variety of non-biblical sources.

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WHO CAME BEFORE COLUMBUS?†

STUART S. SEAMAN*

Evidence of several kinds is adduced to show that people from Europe or the Near East have come to the Americas long before the time of Columbus. The knowledge that such things have happened may help in understanding how men spread throughout the world after the Flood, or after the dispersion from Babel. At the same time, the information found may throw light onto some puzzling aspects of the archaeology of the Americas.

The thesis maintained in this article is that there have been contacts between Europe and the Near East and the Western Hemisphere much before 1492, and before the Vikings who came around 1000 or so. Probably such contacts occurred at least as early as 2000 B. C. The evidence is found partly in artifacts, partly in legends and records, and partly in the resemblance of some natives of the Americas to Europeans.

This matter may be of interest to creationists in at least three ways. First of all, since all truth is one, in a sense, it often turns out that knowledge of the truth about one thing may help in the understanding of something which seems at first wholly unrelated. In the second place, creationists who believe in a universal Flood and in a young Earth have to consider the problem, how the Earth was re-populated quickly after the Flood. The dispersion from Babel no doubt played an important part. The times of interest here go back almost to Babel, according to many chronologies; and the fact that people went from the Eastern to the Western Hemisphere long ago may make it more plausible that they did so even at the time of the dispersion.

Finally, the information presented here may help to throw some light on the interpretation of the table of nations in Genesis Chapters 10 and 11.

White Indians in the Literature

Some literature will be cited, to show that there have been, and still are, natives of the Americas who look much like Europeans. First about the Beothucks of Newfoundland:

The dead husband of Mary March was six feet seven and a half inches.

Jacobus Bastaldus writeth of the inhabitants (of Newfoundland) thus: "They are whyte people and very rustic."

I was led to conclude them fairer than the generality of Indian complexion.

Mary March had: "... hair much like that of a European ..." "... she was a tall fine figure and standing nearly six feet high ..." Compared with the Micmacs they had "... more regular features with slightly aquiline noses, not so broad featured, and much lighter in complexion."¹

Nearly everywhere, however, there existed the tradition of a superior white race who had brought

an ancient culture and erected the great monuments. The well preserved Peruvian tradition was that the stone structures at Quinoa and Huaytara had been built by "bearded white men" with iron tools. Like much of its culture, the white race itself had disappeared, lost in the flood of the "darker peoples".²

Women as fair as English milkmaids were found in Central America. Along the northwest coast dwell numerous tribes which according to accounts must be widely distinguished from the Indians of the interior. The Tlinklet or Koloshian family, consisting of several tribes, are represented as lighter colored than any other North American aborigines ... indeed ... having as fair a complexion ... as some inhabitants of Europe; and this feature, accompanied sometimes with auburn hair, has been considered as indicating an origin different from that of the copper-colored tribes.³

The girls ... gathered around me ... I tried to talk to them in Spanish ... English ... Their inability to talk any of my languages did not seem to shake their confidence in me. I examined their skin closely to make sure it was not colored artificially. It was not. ... their golden hair ... was of a much finer texture than the coarse hair of the other Indians. Their eyes were hazel or bluish-brown. White Indians? ... these were certainly Indians. And they were most certainly white. They were not albinos ... My three little girls looked like healthy Norwegians ... Neither were they ... half-breed offspring ... these ... were invariably dark.⁴

But the discovery of huge stone wheels amid ruins may be the answer. One such wheel was found by Dr. Bennett ... and, on my first visit to Tiahuanaco, I discovered two more. One was almost completely buried under the masses of tumble-down stones at the Tuncu-Puncu while the other was hidden under small rock fragments and sand just outside the ruins. These wheels are seven feet in diameter, about sixteen inches in thickness, and have square holes in the center.⁵

In Mexico there is a very ancient Aztec tradition which says "the first settlers in Mexico were a white race". The tradition continues, saying, "this white race was conquered by a race with darker skins, and the darker skinned race drove the white race from the land".⁶

Both older observations and recent studies have singularly corroborated the natives' tradition regarding Quetzalcoatl's white colony. Bancroft relates ... how the women of Jalisco found great favor ... Father Torquemada ... was shown one ... that might be considered a miracle of beauty; ... she looked like an English milk-maid, says a

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†Drawings in this article, as well as the one on the front cover, were drawn by Soren Jensen, Danish-born artist who lives in Lyndhurst, Ontario, Canada. See information about the cover illustration on the inside front cover.

more recent author . . . these flattering notices he extended to the people of that country in general. Another racial feature . . . was found by Oviedo in Nicaragua, on a man of about seventy years of age, who, namely, had a long, flowing white beard.⁷

The literature quoted above is but a small sample of the thousands of references extant which clearly show a constant flow of settlers to the west from the eastern Mediterranean, Britain, Scandinavia, and continental Europe, from 2000 B. C. (or even earlier) to 1492 A. D.

I feel that there has been a great deal of suppression of the true history of the Americas, by members in good standing of what I have labeled, in a previous work,⁸ "A. W. L." or "Academic Wonder Land". However, I hasten to add that not all academics are guilty of suppressing knowledge. The situation is only too familiar to creationists: once a dogma is established in any study, it is difficult, not only to have the dogma revised, but even to get a hearing for evidence which shows the need of revision.

Naturally, in the space available I cannot discuss all of the peoples who crossed the Atlantic and settled in America (or at least left some traces) before the time of Columbus. So I shall deal with three areas in which I have conducted personal research. It may be, moreover, that these are areas with which readers are not yet familiar. Incidentally, I can hope that these remarks may stimulate comments from some readers, especially in connection with etymology, and ancient British and Mediterranean history.

Vikings in South America?

The reason for beginning with an old standard, the Vikings, is not that they were the first over, but rather that they, along with the Scottish, Irish, Romans, Welsh, and French, were among the last to arrive in any great numbers before Columbus. Many strain mightily to keep the Norse penned up in their formidable Greenland ice cap (although the settlement at L'Anse Meadows, Newfoundland, is conceded). Likewise scholars strain to keep the French, Irish, Scottish, and Welsh where they are considered to belong; while the Jews may be scattered everywhere else, but not in the untouchable Western Hemisphere.

Thomas Lee's great work on the true history of the Canadian North,⁹ Gloria Farley's on the American mid-west,¹⁰ and DeRoo's scholarly studies,¹¹ are either attacked or ignored. The more than 70 runestones discovered in North America are similarly ignored.

Now if the very idea of Viking exploration and settlement in North America is anathema to so many, what would be the reception of their apparent settlement in Paraguay, a land-locked South American country? According to the French anthropologist, Jacques de Mahieu, head of the Buenos Aires Institute for the Science of Man, Danish Vikings and their descendants did indeed explore and settle in South America centuries before the time of Columbus.

The main discoveries are in the northern province of Amambay, and in the Guaira region to the east. Some ceramic shards discovered in the Horoti diggings at the site of a long abandoned village bear the familiar Norse Runic inscriptions, such as prayers to Odin and typical

Viking symbols. Some of the fragments are decorated with fine stylized figures, such as bird-men, exactly like those found on Easter Island in the Southern Pacific. Incidentally, this could be corroboration of the belief that that island was settled by Nordic white men from South America.

DeMahieu's findings seem to agree with those of Thor Heyerdahl, and of Gene Savoy, President of the Andean Explorers' Club. Savoy, incidentally, while once searching for descendants of the "Cloud People", a blond white race who at one time controlled much of the mountainous region of Peru, came upon:

. . . five tall men . . . much taller than the average native of the region . . . they were blond and blue-eyed, with long, thin faces and aquiline noses. They were decidedly white skinned, and I would have identified them as Viking-like. . . . As we visited the villages . . . I began to notice a large number of light-skinned, blue-eyed people. . . . It is clear to me that the descendants of the Chachapoyas are still living, though their numbers are decreasing every year . . .¹²

Central and South America, then, have suddenly come alive with living evidence of the pre-Columbian white ruling population so often referred to in the literature. Sometimes they are "blonds", sometimes they have "red hair"; but always they have "blue" or "green" eyes; and generally they are "considerably taller in stature" than their neighbors.

Dolmens in the United States

A year ago, I was able to see the megalithic structure, called locally the "Balanced Rock", at North Salem, New York, off Route 84. This megalith is shown on the front cover. It is hardly a "balanced rock"; a stone cap lies on a half-dozen or so upright stones, like a table with six legs. The name "balanced rock" would apply better to a monument like the "Thor's Hammer" which Thomas Lee found in central Ungava, Canada. (See Reference 9).

The dolmen is located on a well kept lawn. Beside it is a puzzling (to me, at least) sign which reads "Glacial Period". Evidently the sign is intended to imply that the structure is due to glacial action, and is not man-made. My research (and it has been considerable) in Scandinavia, North Germany, the Iberian Peninsula, the British Isles, Palestine, and North Africa, has included many such stone structures; and they were not the results of glacial or any other natural action, but were artifacts.

In Britain such a structure is known as a "Dolmen"; in north Germany they are "Hünengrab": the "Graves of the Giant Blond Warriors" or "Giant Blond Heros". These names, it is believed, refer to the Nordics, related to the Saxons who were known (in Germany) as the "Super Men". They evidently later migrated to Scandinavia.

Gottlieb Schumacher, a German archaeologist, has reported that in his time (about 1880) the many dolmens in Palestine were called by the Arabs "*Kubûr beni Israil*", i.e., "Graves of the Children of Israel".¹³ Biblical evidence would support the belief that the people of Israel were quite familiar with megalithic



Figure 1. This is a drawing of a menhir in New England.

structures; and they could have used at least some of them for graves. Certainly megaliths were used for graves in other parts of the world.

Mr. Jones, President of the Historical Society of North Salem, kindly provided some additional information. The label "Glacial Period" was the consensus of the opinions of several archaeologists, geologists, and historians who had visited the structure at various times. The cap stone, weighing some 16.5 metric tons, is from New Hampshire, having "travelled" some 320 kilometers. The support stones are local.

The official view seems to be that the glacier carried the cap stone from New Hampshire, and just happened to deposit it on the support stones, which were already in place. I, for my part, simply cannot believe that.

The structure stands alone; there is no jumble of rocks nearby. In particular, there seem to be no other rocks from New Hampshire nearby.

It may be pointed out, also, that some of the stones of Stonehenge were evidently transported about 300 kilometers, from Wales; and nobody ascribes such relocation to a glacier. Some have argued that there is no record of a megalithic culture in America. But, in fact, there are many dolmens, menhirs (see Figure 1) monoliths, stone circles (see Figure 2), mounds, and other artefacts. Indeed, these monuments extend into South America (see Figure 3).

It may be pointed out also that as long as people hold that there was no megalithic culture in America they will ascribe structures of this kind to some natural action. Then, of course, they will say that there is no evidence of a megalithic culture. Here again is the type of reasoning with which creationists often have to contend.



Figure 2. This shows a stone circle in Ungava, Northern Quebec, Canada. A single stone is located in the exact center of the circle. This structure, which is reminiscent of many in the British Isles and in Scandinavia, was found during Lee's archaeological research in Northern Quebec. (See reference 9.)



Figure 3. This inscribed dolmen, at the Pedra Pintada, Venezuela, is carefully set in position in relation to the stars.

In my opinion, these structures in the Americas, like others in other parts of the world, are remains of one megalithic culture. This culture spread out from the Eastern Mediterranean, probably from near Palestine. To the west, such megalithic culture spread across North Africa, up through Europe, to Scandinavia and Britain, and across the Atlantic to America, and even on to the islands of the Pacific. It spread also to southern Russia, and eastward to India, China, and Japan. Thinking, yes, brilliant men built these monuments, as Thom and others have shown.¹⁴ These monuments are the results of a world-wide migration—it might be called a dispersion—from Palestine or a nearby region.

Celtic Connections

There is evidence to show that some of the Celtic people of western Europe reached America long ago. It will be worth while to consider some of that evidence. The consideration may throw some light onto the many

questions about the Beothuck, the extinct people who formerly inhabited Newfoundland.

The members of the New England Antiquities Research Association have been foremost in confirming the pre-Columbian Celtic presence in the United States and Canada. I might mention especially Robert Stone, Barry Fell, Byron Dix, James Whittall, Robert McGhee, and David Kelly. They have combined efforts in the many disciplines required until, as for the Celtic presence, in the words of Dr. Barry Fell, Professor at Harvard University: "There's absolutely no doubt about it".

The evidence includes many buildings, astronomical stone alignments, and inscriptions in the Ogham script, which is known to have been used by the European Celts. Such remains are found especially in Vermont and New Hampshire in the United States; and in Newfoundland in Canada.

Dr. Fell, it is reported, has dated the sites in New Hampshire between 800 and 600 B. C. The astronomically aligned stones in New Hampshire and Vermont bear a curious resemblance to Stonehenge in England, and to the stone structures on the Island of Lewis in the Hebrides.

The Ogham stone of Newfoundland may well be of especial interest to readers, not least because it may be related to the Beothuck "red Indians". While this Ogham inscription is not as well known as the others in the United States, it could throw much light onto Canadian pre-Columbian history.

The Beothucks were called "Red Indians", not because they were "red skins", but because they had a habit of painting themselves with red ochre. This was also a custom of the early British Celts; and they picked up the custom from the Picts or Pictish (Painted Men) of the British Isles. It is interesting to notice that some think that the Greeks called the Phoenicians of the Eastern Mediterranean "Painted Red Men".¹⁵

The Beothucks were generally large of stature. According to John Lewis, a Mohawk Metis who could speak several Indian dialects; the Beothuck language was unknown among the other Canadian tribes. Generally, the Beothucks seem to have been white of skin, and their hair was of the texture common among Europeans, and ranged in color from black to blond. The consensus of opinion of Europeans who first made contact with them was that they were not Indian.

In view of all this, the following interpretation of the origin of the Beothuck is presented. Certainly the evidence falls short of proof; yet I believe that there is enough to justify consideration and further investigation.

Moreover, this suggestion has a bearing on the Ogham inscription just mentioned. First, then, something more may be said about that inscription.

Dr. Robert McGhee, Professor of Archaeology at Memorial University, St. John's, Newfoundland, Canada, and James Tuck, another Archaeologist, were shown the inscription, it is reported by Lloyd Decker, a fisherman and custodian of the ruins of a Viking settlement not far away.

McGhee stated that the inscription bore no resemblance to any script previously discovered in North

America. (This was before the confirmation of the Ogham inscriptions in New England by Dr. Fell and others.) McGhee observed that if it were a hoax (which is always an easy explanation) it was an old one. Tests showed that the lichen covering the inscription was between 100 and 200 years old.

So if it were a hoax it was perpetrated in the late 1700's, in a remote area of a remote island. Why would anyone perpetrate a hoax which was very likely never to be seen? And how would the (supposed) hoaxer know of the Ogham script? It was invented, a long time B. C., and seems not to have been used since about 700 A. D., when the Roman Church superseded the Celtic Culdee church and customs in the western part of the British Isles. So here is more evidence of a Celtic connection in Newfoundland. Could it be connected somehow with the Beothucks?

A Possible Origin of the Beothucks

The suggestions to be made here are, it is admitted, somewhat speculative. Also, some of the source literature may be suspect. But, it may be answered, so was Homer's Iliad when Heinrich Schliemann began his investigations. Some called it "a fiction full of monsters and wondrous beasts . . .", and worse than that. As for Schliemann himself, many scholars of the day dismissed him with not a little show of contempt. Yet with only the Iliad for direction, Schliemann and his Greek wife Sophia dug up King Priam's Troy.

To continue, note first that "Beothuck" has also been spelled "Beothook", "Beothick", "Beathook", etc. There has often been re-arrangement of the vowels.

Now the name "Beothack" appears in the *Leabhar Grabhala*, the history of the Celtic Danann who migrated from the Mediterranean to Ireland. It occurs in the geneology of a famous prophet, one Iarbanell, who died in the British Isles. His geneology reads in part:

The children of Elathan, son of Dealbaath, son of Ned, son of Iondae, son of Alldae, son of Tai, son of Tabarn, son of Enna, son of Baath, son of Iobath, son of Beothack, son of Iarbanell the prophet, son of Neimhedh, son of Agrorman, . . ., etc.

So this Beothack (one vowel removed from Beothuck), the son of a prophet, a leader in his day, no doubt, migrated to the British Isles.

Could it be that he, or his descendants, went on to Newfoundland? It is apparent from the genealogies in Scripture, and from the Scottish clans, how a whole people may take the name of a renowned ancestor. Obviously, more study is needed here. However, evidence is not so scanty as might be expected; in fact, there is a wealth of pertinent literature.

Some may wonder whether the Celts had the ability to cross the Atlantic. First of all, it may be noticed that Caesar found in Gaul a presumably Celtic seafaring tribe, the Veneti.¹⁶

Moreover, according to some accounts, there was considerable learning among the Celts. It is said that Hu Gadarn Hysicion, (Isaacson), or Hugh the Mighty, led the first colony of Cymri into Britain from Defrobane where Constantinople now stands.¹⁷ This Hugh is said to have been a man of great learning, from whom

the Druids learned many things. One of these was the Ogham script, which the Druids used for many centuries, along with Greek, and, later, Latin. The Culdee, i.e. Celtic Christians, also used this script, until the time when all of the distinctive features of their church were suppressed by the Roman church.

Both the Druids and the Culdee had many schools. In time, Ireland, under Culdee scholarship, became the main center of learning for western Europe.

According to the book, *The Early Scottish Church*, Christians arrived in Britain from Palestine or nearby as early as 37 A. D.¹⁸ If this is true, the British church would be among the premier churches of Christendom. The name "Culdee", incidentally, has been taken to be from "*Cultores Dei*" (Worshippers of God), or "*Gille De*" (Servants of God); but such suggestions, while ingenious, seem not to be true. In fact, "Culdee" seems to be an anglicised form of "Culdich".

Originally, however, "Culdich" seems to have meant "Refugees". According to one Freculphus, some Judean refugees came to the west of Britain in the early years A. D. Arviragus (Caractacus) king of the west Britons, received them graciously, and settled them in a Druids' college.

From such a beginning, it is said, grew the Culdee church, which had many great leaders, such as Cumman, Adomnan, Cuminius, Joannes Scotus, Columba, and St. Patrick (MacIgwyn). It is interesting that some of these men, such as Columba and Patrick, are counted as saints of the Roman church, although during their lives they were Culdee and nothing else. Patrick, for instance, was born at Llantuit Major, the son of a Culdee presbyter.

Be these origins as they may, it is evident that the Culdee loved knowledge; and in their times—yes, and earlier—there was a quite high level of learning among the Celts. It is said that Culdee scholars were taught arithmetic, geometry (incidentally, Thom—see reference 14—has shown recently how old some geometrical knowledge may be), astronomy, music, grammar, logic, rhetoric, and, last but certainly not least, the Holy Scriptures. There is no reason to suppose that their learning did not at least equal that of the Druids, who were contemporary or somewhat earlier.

As for the Druids, it is said that students took 20 years to master the complete circle of knowledge. This knowledge, according to Caesar, included the stars in their motions, the magnitude of the Earth and its divisions, natural history, and the power and government of God.¹⁹ Some have even suggested that the Druids had some knowledge of the telescope; and that that is the origin of the story, told by Diodorus Siculus, that they were able by magic to bring the Moon down to the Earth.

Thus, it is quite likely that the Celtic people had the skill and knowledge necessary for voyages to the Western Hemisphere. Actually, as has been remarked earlier, such voyages were not something new in those times, for there is evidence of many crossings to America, quite likely extending all the way back to the dispersion from Babel.

Did Any Visitors Travel Eastward?

This question must be considered, for it is commonly held that the Americas were settled by people who crossed Bering Strait. It is, of course, quite possible that there were some such movements of people. But they would have nothing to do with the matters which have been discussed here.

Any who arrived by the northern route are commonly thought to have been quite primitive. So they would have left little enough in the way of artifacts by which they could now be traced; and certainly nobody proposed that they might have left written records or inscriptions. So their history, whatever it be, is independent of the history of visits westward to the Western Hemisphere.

There is also some evidence that visitors, or maybe settlers, may have come across the Pacific, at some time in the past, maybe from China or Japan. This matter needs more investigation than it has received so far. But for the present it is another story.

Conclusion

Evidence has been presented to show that there have been journeys from the Near East, or from Europe, to the Americas, as far back as can be traced. Arguments have been given for thinking that such happenings go back all the way to the dispersion from Babel. Moreover, the fact that such journeys were possible shows that a quick dispersion of people throughout the Earth, in which anyone who believes in a young Earth must believe, was quite possible.

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CAVE FORMATION BY ROCK DISINTEGRATION

DOUGLAS E. COX*

The processes generally cited in theories of cavern formation are corrosion† and solution. Neither of these processes adequately explains the presence of cave fill in many caves. A new concept in cavern formation involves a possible disintegration process due to release of former high pressure on sediments that were being elevated from depths in which they were formed. This process can account for the relationship of cavern plans to joint systems, the generally horizontal development of caves, and other characteristics besides accounting for the formation of cave fill in place. This avoids the problem of explaining how cave fill can be transported into caves from outside. Application of the theory of disintegration to problems of origin of dome pits in caves is discussed, and the possibility of this explanation of the formation of caves in non-carbonate rocks is suggested.

Some Theories of the Formation of Caves

Much discussion about the origin of caves involves the notion of a zone of ground water saturation, called the water table. Some writers, such as Davis¹ and Bretz² believed caves were originally formed by solution below the water table. These conditions are described as "phreatic".

Davis and Bretz suggested that some caves have been formed in conditions that were phreatic, and that there has since been a change to the present vadose state in which these caves are found today. The term "vadose" refers to "water that is in the zone of aeration, and therefore on its way down from the land surface to the zone of saturation".

According to these writers, the water table in many cavernous regions has dropped from a former higher level. However this idea has not proved acceptable to some speleologists. Where caves occur in rugged mountain regions, the idea of a former high water table is difficult to entertain. Caves in mountainous areas occur in the Rocky Mountains, and also in various parts of Europe. How could the former water tables in these mountainous rocks have remained high long enough for solution to erode out the cavities in them?

Early speleologists attributed the major role in cavern formation to corrasional activity. Streams in caverns can often be found enlarging their channels, and it was supposed that cave systems had been formed by this process. Yet it is difficult to see how corrosion would be possible if an initial passage were not already present in the rock. The question remains, how could the cavity have been initiated?

The history of speleology involves a conflict between these two kinds of explanation of cavern formation. Each view appears deficient in certain respects. The shortcomings of each view were stated by Davis:

No account of caverns that I have read explains, in case the author favors solution excavation, how it can proceed when galleries grow so large that only thin, discontinuous films of water trickle down their walls, films from which evaporation should discourage solution and provoke deposition instead; or in case the author favors corrasional

excavation, how that process can produce galleries of the network pattern which prevails in large caverns.³

Davis recognized that dripstones have begun to form in caves only after their excavation was completed. The present conditions, he pointed out, were not those in which cave systems originally formed. The history of many caverns involved two cycles of events, first a phreatic cycle, in which caverns were formed by solution, and secondly a vadose cycle, following a drop in the water table. In this second cycle the dripstones have begun to form.

The Presence of Fill in Caves

Caves rarely enlarge very much in vadose conditions, Davis believed. To his idea of two cycles in cavern formation, Bretz introduced the concept of an epoch of deposition in the history of many caves. He suggested that after the initial development of caverns a period of clay filling of the passages and chambers occurred, before the lowering of the water table. He showed that many caves are completely filled up with cave-fill, usually consisting of red clay, and that this fill is now being eroded by streams. Caverns with little fill often contain fragmentary remnants of formerly extensive fills, in the form of deposits high on the walls and in pockets and branching passages.⁴

The presence of cave fills seems anomalous to present ideas about the formation of caves. It is sometimes mentioned in the literature that the fills do not usually come from the detritus left by the process of excavation of caves, but must have been somehow brought into the caverns from outside. The fill could not have been present in caverns while they were being excavated, because solution and corrosion could not occur below a protecting layer of cave-fill.

No problem in speleology is quite so ticklish as the question of the origin of cave-fill. Present theories about cavern formation attempt to account for an empty space in a rock, by processes of solution and corrosion, and the means by which such extensive fills could have been deposited are not readily apparent from theories of cave formation.

Discussing the origin of fill in Breathing Cave, Va., George H. Deike III wrote:

I haven't satisfied myself that I understand how some of the fill material was deposited. The fills consist of lenses of silt and sand, with a great deal of coarse conglomerate in many places. The deposits look like free surface stream channel deposits . . .⁵

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†"Corrasion" means erosion by the abrasive action of running water containing sand, pebbles, and other debris. This is in contrast to "corrosion" which means a chemical action such as formation of a rust, or the "eating away" of a substance as nitric acid corrodes copper.

It is particularly difficult to imagine how coarse gravels, containing pebbles and boulders up to cobble size, could have been brought into the caves. These could not have been transported except by rapid currents. The gravel occurs throughout many caverns, even within blocked passages where former rapid stream currents are difficult to conceive. Postulating a period of phreatic submergence does not resolve this difficulty. Commenting on this problem, Sweeting wrote: "In some caves cobble deposits are found in passages where it is difficult under present conditions to see both where they came from and how they got there."⁶

Jennings believed that the extent of former cave fills may have been exaggerated by many speleologists. He wrote:

As well as active channel deposits, abandoned stream deposits are frequently found in caves, e.g. as terraces. Some caves may be practically filled with gravel like Baldocks Cave, Mole Creek, Tasmania, where the fill is probably of Pleistocene glacialfluvial origin. However, too frequently inference of thick or complete fill has been made from small patches of deposit in high positions in cave walls.⁷

Cave fills may consist of clay, sand, or gravel, and also of conglomerates or cemented gravels. These materials are all considered to have been formed by deposition in streams flowing through the caves after original excavation of the cavities.

Some of the cave fill exhibits the pattern of cross stratification. Davies showed that the fill material in Salts Cave, Dismal Valley, Kentucky is cross stratified sand and gravel. He supposed that the fill in caves is deposited after the development of the cavity. He wrote:

Cave fills of clastic materials are deposited towards the end and after the integration and mature development of cavern passages. The clastic material with included clay and fine silt suggests deposition in alternately submerged and open passages, a condition to be expected as the time of stability draws to a close.⁸

Davies also noted that many caves contained fills that were packed tightly to their ceilings. In a discussion following the previously quoted article, he stated: "I would like to point out that in the Appalachian caves most clastic fill is topped either by clay or fine silt. This material is generally packed tightly to the ceiling and reflects deposition in pools in blocked passages . . ."⁹

It seems difficult to conceive how fill could penetrate water filled caves, and pack them so completely in stratified layers. It seems that there would have to be some space near the top of such a deposit for water to exit after depositing the sediment.

Depositional Origin Seems Improbable

A depositional origin of cave-fill appears particularly improbable when considering the presence of large pebbles and cobbles. The gravel could hardly have been transported upwards, to levels higher than the cave exit, by streams flowing into the cave. Yet it is consistently claimed that cave-fill has been brought into the caves from outside.

A proper idea of the extent of cave-fills is often difficult to obtain, since the floors of caves, when consisting of fill, conceal the true dimensions of the chambers. Since the theories of cave formation do not easily account for the presence of all this material, many speleologists tend to underestimate its extent.

There is a tendency, in scientific observations, to notice only the evidence that seems to fit in well with what accepted suppositions and patterns of interpretation of natural phenomena would lead one to expect. Facts that do not fit into current patterns of interpretation often escape close scrutiny. For this reason, it seems, the extent of many cave fills may not have been fully recognized and reported.

An exception to defects of this nature in the writings of speleologists is the work of J. H. Bretz. Bretz comprehended the extent of former and present cave fills more completely than many speleologists either before or since publication of his reports.

Bretz was able to show, because of a number of mining excavations in the fills inside some cave formations in the Galena dolomite of Illinois, Iowa, and Minnesota, the profiles of caves that were almost completely filled up. One passage was excavated, in the course of mining operations, to a depth of 40 feet without any sign of rock bottom. The fill material was described as "soft dolomitic sand". The excavation was conducted in part of Crystal Lake Cave near Dubuque, Iowa.

In this cave, fill was quite extensive, and occupied most of the volume of the passages, and some passages completely. These filled passages and chambers were sometimes discovered only as a result of excavation. In his description of the caves, Bretz stated:

The ceilings are low throughout the system, and head room for visitors in the opened part of the cave is secured by excavating trenches for foot-paths, as much as three feet deep, in the fill. This excavation has revealed the tops or ceilings of several north south and quartering routes that are entirely filled. How the bottoms of the different members are related would be very interesting to know.¹⁰

All of the passages, Bretz reported, contained fill, and the cave does not seem to have ever contained a vadose stream. The head room in passages off the visitor's route Bretz attributed entirely to compaction of the cave-fill.¹¹

Where streams occur in these filled caverns, they are in the process of eroding channels in the unconsolidated fill material. Some caves are completely filled above the point of entrance of a stream, and also beyond the point of its exit. Bretz described an example of this in Meramec Cave in Missouri:

The stream in Meramec Cave has left terraces on the sides of its valley in the fill, the tops reaching almost to the ceiling. Farther downstream, the terraces are so wide and so close under the ceiling that a narrow trench in the clay is the only open space. By a good inference, Meramec is still completely clay-filled beyond the place of escape of the stream.¹²

Cave investigators sometimes find themselves crawling through passages with low ceilings, that are

extensive in the horizontal plane. The floors of these passages may be damp and dirty, but few would suspect they may be crawling along on top of a thick layer of unconsolidated material, that mostly fills up a chamber of much larger proportions than the constricted passage through which they are trying to inch their way.

In some cases the floors in caverns containing fill are sloped parallel to the ceiling. Bretz cited an example in Craigshead Cavern, Tennessee, and interpreted its significance. The fill, he suggested, had been compacted, and formerly filled the cavern entirely. He wrote:

Craigshead Cavern, Tennessee, has some chambers with dip-determined ceilings in which the clay fill beneath, untouched by the numerous slump pits, is sloped accordingly. There is a clearance of only a very few feet. This can record only compaction of a fill once tight against the ceiling slope.¹³

These reports would lead one to wonder why the fill in caverns so frequently fills up the passages and chambers entirely. A cave is usually thought of as an empty or rather air-filled space within a rock. But it is natural to think of caves in this way, for those who explore caverns are occupied with problems of getting through them, and squeezing through narrow holes and cracks. Yet inquirers into the question of the mode of origin of the caverns may find it advantageous to picture caves from a different point of view.

A Different Viewpoint: Caves as Filled Cavities

Instead of thinking of a cavern as an air filled space in rocks, why not consider them as filled cavities? The caves, according to Bretz, were often filled up with unconsolidated material prior to the initiation of present conditions. The erosional activities of streams, and the deposition of calcite on dripstones are presently occurring in vadose conditions. The dripstones began to form only after the formation of the caves, and this process is one of deposition rather than one of excavation.

Considering the problem of the formation of filled cavities, rather than trying to explain how an empty space might be formed within a rock, would lead one to consider the possibility that a change in the consolidated rock at depth may have resulted in large chambers and passages being formed, by an alteration of part of the host formation. Portions of the rock changing from the *consolidated* to the *unconsolidated* condition would result in filled caverns within the rock.

Formation by Rock Disintegration

A process of rock disintegration that may have an important application in the theory of formation of caves is a possible effect of the rapid release of former high pressure on rocks of the continents. This process has been outlined in another article by the writer.¹⁴

Investigations by the writer into the nature of the pattern of cross stratification in rocks and unconsolidated material indicate this pattern may have resulted from a process of shattering rather than by deposition of sediments.

According to this alternate explanation the shattering was a result of the release of former high pressure on

sediments containing diffused water, which became occluded within the rock as pressure decreased, causing its disintegration. The formerly homogeneous rock was thus converted into clay and sand, and gravel. Development of concretions in the rock before its disintegration, that remained intact during shattering of the matrix around them, accounts for the formation of cobbles and pebbles. These would have been formed in the positions they now occupy, and need not have been transported into the caves from outside.

The pebbles and cobbles found within caves may vary in composition, which has led speleologists to the conclusion they have been brought into caves from other regions. This explanation, of a concretionary origin of these stones, would explain their varying composition. Concretions develop in rocks by the accumulation of small amounts of impurities being precipitated from a diffusion equilibrium in the solid as pressure is released. An explanation of the formation of pebbles and boulders occurring in caves in the places they occupy today solves a most difficult problem in speleology.

Such a disintegration process may have operated at some time in the past, but is nowhere acting at the present time. Caves are only as old as the rocks in which they occur, so the disintegration must have followed the deposition of limestones and other sedimentary rocks where caves occur.

Former high pressures may have existed during the formation of many of the sedimentary rocks of the earth's surface. Some rocks, such as dolomite, seem to be deep-water sediments, and require a former high pressure for the combination of the molecules that comprise the rock. The dolomite molecule is apparently unstable in solution under ordinary conditions.

Lithification of the sediments may have also resulted from the release of pressure, as diffused cementing material crystallized and caused the rocks to harden. The release of pressure on these rocks would have accompanied their elevation from the depths to their present height.

Departure from Uniformitarianism

Clearly these events involve a departure from the usual uniformitarian approach to problems of the past history of the earth, and methods of accounting for its features. But the postulate that former high pressure has existed is not more difficult to entertain than that caves have been through a cycle of phreatic conditions. For the maintenance of prolonged phreatic conditions in high mountains, continents would need to have been submerged.

In both cases, that is, in the postulates that former high pressure has existed and that rocks containing caves have passed through a phreatic cycle, former conditions are supposed to have been different from those existing at the present time. The difference is in the kind of former conditions that must be imagined.

The possibility of a former process of disintegration adds another type of geologic activity to the number of possible causes to be considered in accounting for the formation of caves. This process could be an aid in accounting for the formation of filled passages and chambers, that may have afterwards become excavated by

streams or other means. The formation of dripstones in empty chambers would follow.

One feature of the dripstone formations tending to confirm that their growth has begun only after the cave's formation is the fact that they rest on top of the layers of cave fill. They are not found penetrating into the fill, as if they existed prior to the deposition of this material. Nor are fossil dripstone fragments found within the cave-fill.

This would lead one to conclude that conditions in the past have, in fact, been quite different than those prevailing at the present time. This observation would apply to all areas where caves occur.

Studies of the present patterns of streams in caverns also show that former conditions, in which the caves were actually formed, were not the same as those existing today. Bretz, in the abstract of his 1942 article, wrote:

Most living cave streams are misfits, engaged in altering ground plans and chamber cross sections, better to suit their needs, and doing this by familiar procedures of surface streams. The chambers and ground plans undergoing alteration have been inherited from earlier, different, and now vanished conditions to which the caves were adjusted. The alterations are superimposed readjustments to the new conditions.¹⁵

Former conditions of sedimentary precipitation of the limestones in which caves occur were indeed quite different from those existing anywhere on the earth at the present time. Limestones of great extent are found around the world. Having been deposited beneath the sea, they are now high above sea level. It is supposed that their uplift was accompanied by a release of pressure, providing an environment for the disintegration to occur.

At the time of uplift, recently precipitated rocks may have been subjected to some tectonic disturbance, that resulted in the formation of joints and fractures within the rock. Many of the limestone rocks of the Appalachians are folded and contorted. The movements accompanying elevation of rocks could initiate patterns of joints and fissures that are significant in determining patterns of cave systems.

Relationship of Caves and Joints

Speleologists have long recognized that most caves follow the patterns of joints in the rock; that they are "joint controlled". The feature was pointed out by Davies: "Plans of most caves in folded rock reflect local rock structures. The passages are joint controlled; faults exert very little influence and a passage rarely follows a fault for any great distance."¹⁶

The same feature was noted by Bretz in his description of the caves in the Galena dolomite. Bretz was impressed by the relationship of caves to joints, and showed that their patterns could not have resulted from stream erosion. Bretz wrote: "The cave systems commonly are reticulated patterns, faithful delineations of the joint system of the formation, with no integration towards a trellised subterranean drainage pattern."¹⁷

In harmony with conditions described for a disintegration process of cavern formation, a disturbance

initiating the patterns of joints and fractures in rocks would likely have resulted from their uplift. Probably this uplift was accompanied by release of pressure as waters flowed back off the continents and into the oceans. In such conditions each joint or fracture would become a low pressure zone. The rock surrounding joints would be under high pressure, and a sudden fracture in rock under stress would result in release of pressure in the immediate vicinity of the crack.

These conditions would be favorable for a process of disintegration due to precipitation of water diffused in the rock at the higher pressure. When pressure in the vicinity of a crack decreased, the water in the rock would have been expelled too quickly. Expansion probably began before the water diffused out; hence, the rock shattered.

Shattering of the rock in the vicinity of joints and cracks could very well have caused an enlargement of cavities following the pattern of joints. These became passages and chambers filled up with unconsolidated material: sand, clay and gravel.

The release of pressure due to uplift of sediments from depths sufficient to cause diffusion of water within rocks is thus sufficient cause to explain filled cavities in rocks, and account for their relationship with the patterns of jointing.

As the disintegration of rock occurred in the vicinity of a crack, the walls of the crack were converted into unconsolidated material: sand, clay and gravel. Possibly some expansion accompanied this disintegration. The increased volume of the disintegration product would build up pressure in chambers and passages, and eventually cause the disintegration to cease once equilibrium was attained.

Pressure built up by expansion of the disintegration product may have caused some cracks to widen. This would be rather like cracks in rock being propagated by expansion of freezing water in them.

The process of widening of cracks in this manner may have aided in spreading the disintegration, once begun. Cracks may have been extended because of pressure of disintegrated matter in them. If there was lateral movement, the material would settle to the bottom, and subsequent compaction of the unconsolidated material would leave cavities above the layers of fill.

Evidence from Cave Profiles

If disintegration occurred around a vertical crack for example, the pressure of the expanding material inside would tend to push the walls further apart, and extend the crack higher and deeper. The material inside would eventually settle down to the bottom of the cavity, leaving a passage along the top. The caves would thus be mostly filled passages with an empty space at the top. A study of the profiles of caves and their fills shows this disintegration approach may have some merit in accounting for their origin.

Bretz was able to give partial profiles of a number of caves in the Galena Formation, and in one case he included a profile of the cave in its filled part as well as the empty chamber. This was in Crystal Lake Cave, and the profile is given in Figure 1. Bretz reported:

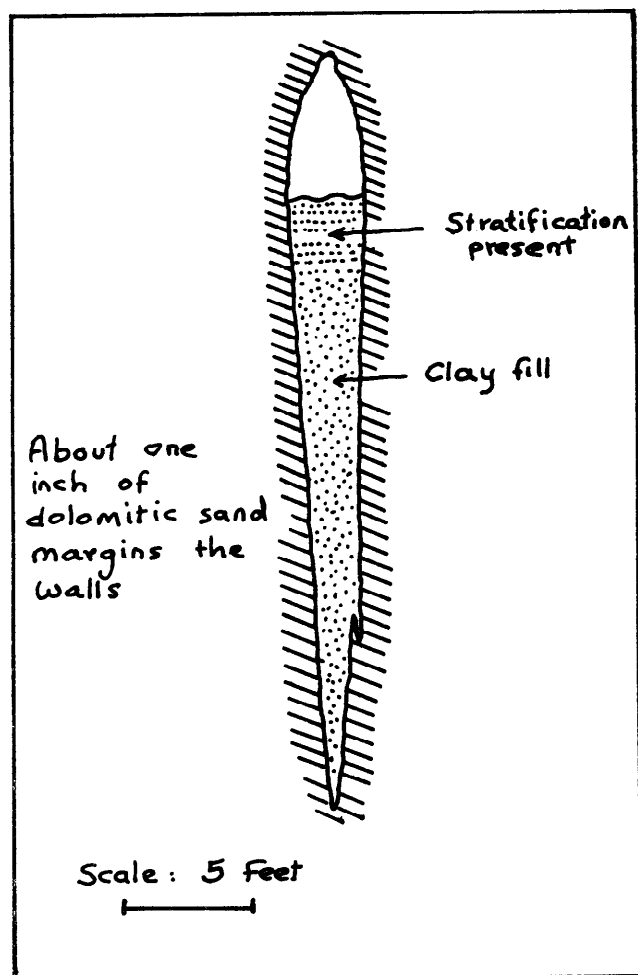


Figure 1. This is a profile of part of the Crystal Lake Cave, a few miles south of Dubuque, Iowa on Highway 52, in which it has been possible to determine the extent of the filled part, as well as the empty chamber. This is adapted from Bretz's work, reference 10, by permission.

(The section shown) is a special case, a cross section in which it was possible to show extent and proportions of the filled part as well as of the empty chamber. A shaft had been dug here 60 years ago, in search of ore, and was entered in this study by block and tackle and bosun's chair. The gradual downward narrowing to become a slot at the bottom is significant of conditions of origin of the chamber or crevice. With data from some of the mine workings, as reported in the literature, it indicated that the cave floors known in the region are far from stream-determined floors.¹⁸

Bretz believed that Crystal Lake Cave had never contained a vadose stream.¹⁹ The disintegration explanation given for the formation of filled caverns can account for an empty chamber above a much more extensive filled cave, without any need for either stream action or phreatic solution. The theory also accounts for the joint determined plan of cave systems. It may also explain a trend towards horizontal development of cavern levels, as pressure levels during disintegration would tend to be horizontal.

Caves in some regions trend towards a horizontal development at various levels. This is true even where the bedding of the limestone is tilted to almost vertical. Solution, it might seem, would favor penetration of the rock by water along bedding planes, but development of caves in areas of folded rock does not follow this pattern. White reported:

Several caves in nearly vertical limestone have been examined. In none of these had solution extended any distance along the bedding in a vertical direction, even though a favorable bed and good partings existed in that direction. Instead the caves are limited to a nearly horizontal zone . . .

These data show that caves tend to maintain their horizontal pattern in spite of structure and lithology.²⁰

White gave a list of 77 caves in Pennsylvania, and only three of these had any vertical relief. Others had sloping passages but for the most part were confined to one plane.²¹

The fact that caves cut across inclined bedding and remain generally horizontal would have a possible explanation in the theory of a disintegration process in cavern formation, resulting from the release of pressure during uplift of sedimentary rocks from the depths. The disintegration would occur at a certain level favorable to the shattering process. This level would sink lower with continued decrease in pressure.

The shattering also depends on the rate of release of pressure. If the rate of release of pressure were slow, no shattering would be likely because the water diffused in the rock would have time to escape. The presence of joint systems would also seem necessary for shattering to occur deep within the rock.

Disintegration in the region of a joint system would be almost simultaneous at the same level, and would tend to be in a horizontal plane. Successive cave systems may occur at lower levels, that formed during continued release of pressure. A plane of disintegration would descend as pressure decreased.

Gravel Terraces: Inside, Outside of Caves

An interesting correspondence between the levels of caves and the levels of gravel terraces in surface valleys in the region was noted by Davies.²² This correspondence may be interpreted in the disintegration theory, that the gravels were formed by disintegration of bedrock during a release of former high pressure in the region. The correspondence between levels of gravel terraces inside and outside caves may be due to the simultaneous formation of the gravels at the same pressure level.

This phenomenon would be difficult to account for by depositional processes and the principle of uniformitarianism. Both gravels in caves and in surface valleys may occur at multiple levels, and these levels are spaced similarly in cave systems and in surface valleys. Davies wrote:

Distinct multiple-level passages occur in four of 277 caves in folded rocks in West Virginia. With no significant exceptions these passages maintain uniform slope and vertical spacing in the caves. In checking the elevations of the passages against sur-

face features there is a close tie between the vertical spacing of river terraces and the vertical spacing of cavern passages within a region.²³

The network pattern of cave systems, their correspondence with joint systems, and their generally horizontal levels are all well suited to the theory of a disintegration origin, due to release of former high pressure on sedimentary rocks during uplift, and the subsequent excavation of passages and chambers by streams.

Other features of caverns mentioned by Davies may also be easily explained in a disintegration theory of origin. Among caves in folded limestone in the Appalachian region, Davies wrote, major caves occur along the valleys, and cavern passages decrease in size and become more numerous in portions of the cave away from the major surface valleys.²⁴

In the disintegration process, pressure levels underground would be affected by the presence of valleys. These levels would be depressed in the vicinity of a valley, as pressure decreased in the region. The plane of disintegration would follow the surface of equal pressure, and so caves may be expected to slope upwards from their exits in the sides of valleys.

Also the widening of joints by expansion of material disintegrating around them would be most probable where the joint ran parallel to a valley. Rocks enclosing joints parallel to valleys would yield more easily than those enclosing joints normal to surface valleys. Expansion of the disintegration product in joints away from the sides of the valleys would be more limited because of confining pressures, and so cavern passages would tend to be smaller away from valleys.

Hollows, Potholes, and Other Holes in Caves

The theory of a disintegration process causing the formation of filled caverns accounts for many features of caves that have been previously attributed to the effects of solution processes. The presence of hollows in the roofs of caves, and high in their walls has been cited as evidence that caves have passed through an epoch of phreatic conditions, when water penetrated all the joints of the rock and filled the caverns completely. The hollows and pockets in the roofs of caves, to have been formed by solution, would require a former phreatic state.

Describing Crystal Lake Cave, in Iowa, Bretz wrote:

Almost wholly, the roofs are original and preserve the solutional patterns. Pockets, (somewhat resembling irregular potholes upside down) are common, some of them so complexly and irregularly developed that they penetrate into one another and produce arches and bridges. Solution to make these roof pockets occurred only because the cave was full of water at all times, not as a vadose stream may in flood time fill it to the roof.

Were the latter the case, air would tend to occupy such pockets, and there could be little solution.²⁵

The roofs of some caves contain large cylindrical structures like potholes, called dome-pits. In some cases they contain horizontal flutings on the walls. Caves with cylindrical structures of the shape of potholes were described by Bailey in central Tennessee. These

potholes, up to 15 feet in diameter and 40 feet high, had walls that were "gracefully carved by the water".²⁶

Although the presence of potholes in caves is generally taken as evidence of effects of corrasion by water, facts presented by the writer in another article discount this assumption.²⁷ Potholes may actually have a quite different origin. For the cylindrical structures to have been formed in caverns by corrasion would require stream currents in restricted passages, with velocities that are incompatible with known causes and present conditions.

Potholes in caves of southwest England were studied by Ford.²⁸ Potholes and remnants of potholes in the walls of caves above the level of present stream activity led him to conclude that the streams that formed the potholes were larger than the streams there today.

In the opinion of the writer the larger streams postulated to have existed in caves during the formation of the potholes would be unlikely because the size of caverns in former times must have been smaller than at present. Also the horizontal levels of caves containing potholes could not have given rise to currents of sufficient strength to erode deep potholes in rocks. Some speleologists have supposed that greater stream velocities existed in caves in the past, causing pothole erosion, due to hydraulic pressure from an undetermined source.

Some remarkable examples of potholes and dome-pits in caverns were described by Davis.²⁹ In Mammoth Cave, Kentucky, dome-pits occur up to 50 feet wide, and from 10 to 200 feet high. These are vertical, cylindrical cavities with arched tops and deep bottoms, with fluted walls resembling potholes. They frequently occur along joints or small faults. Like potholes, they tend to broaden at the bottom. Davis wrote, describing Shelby's Dome in Mammoth Cave: "Shelby's Dome rises sheer 145 feet over the floor of Bottomless Pit, the walls being in most places absolutely vertical."³⁰

In some places the dome-pits connect two or more levels. Davis thought the possibility of their formation by solutional processes unlikely. He called the problem of their excavation "a puzzling matter".

Gaping Gill, a famous dome-pit in England, is a vertical shaft 360 feet high. It is narrow, elliptical in shape and contains flutings on its walls. These shafts are also referred to as "pitches" in England.

Another deep vertical shaft known as Proventina occurs in the Pindus Mountains in N.W. Greece. Altitude of the shaft is 1,840 m., and dimensions are 200 m. deep, 25 m. x 33 m. wide. This was described by Eyre as "the cleanest shaft I have ever seen."³¹

These vertical cylindrical cavities in caves are difficult to explain either by corrasion or solutional processes, but the possibility of a disintegration process related to release of former high pressure may aid speleologists in accounting for the specific features. A process of disintegration within rocks, beginning at a crack at depth and proceeding during a continuing release of pressure, may proceed vertically downwards and upwards from the crack at the same time.

Each succeeding surface exposed by disintegration of the preceding surface would have become subject to shattering; and the surface of disintegration would have moved upwards and downwards into rocks at higher

pressures containing diffused water that precipitated out near the exposed surfaces, continuing the disintegration in a vertical shaft maintaining the same diameter. Flutings on the walls could be records of successive levels of the surface of disintegration.

Initially these shafts would have contained fill but this evidently has been eroded away or compacted since the time of formation. It would seem from the theory of disintegration that vertical shafts would be more likely to form in the floor of caves than in the ceilings, but must in most cases be buried in the fill.

Caves in Non-Carbonate Rocks

The concept of a process of disintegration within rocks during a former elevation of the continents from depths of burial under water would account for the formation of caves in carbonate and non-carbonate rocks equally well. Caverns have recently been reported in rocks that are not normally regarded as soluble, in Lower Precambrian sandstones and quartzites of the Venezuelan Guiana Shield.³²

These caverns occur in mountainous regions. They are not just small openings but huge cave systems. A cave in Cerro Autana is 395 meters long with labyrinthine passages. The entrances are located in a cliff 1,000 m. high and are 150 m. below the summit of the mountain.

Shafts up to 400 m. in diameter and 370 m. deep occur in the Sarisariñami mountains. Other caves occur on Guanay mountain, and a huge one was reported near Roraima mountain. A cave system with over 1,000 m. of passages is known to exist in the Maria Luisa mountain.

Cavern enlargement in Frost Creek Cave, California was two thirds greater in non-carbonate schists than in the limestone section.³³ These facts and their interpretation in the terms of usual corrasional and solution processes would appear quite mysterious. However the concept of a disintegration process, as significant in cave formation, may help clear up these problems in speleology.

Implications of Disintegration Theory

The disintegration process outlined in this article requires a former deep burial of the rocks in which caves occur, now found high above sea level. The rate of elevation of these rocks would need to be rapid for the effects described.

The possibility of such events in the past, which are not apparent anywhere on earth at the present time, should be determined from studies of the Earth's features. The writer is of the opinion that past causes should be considered that are at least sufficient to explain the effects. This is not to deny the reality of causes such as corrasion and solution, that are in operation at

the present time. The process of disintegration should be considered along with these causes as possible explanations for the features of caves.

Acknowledgement

I would like to thank H. L. Armstrong, Editor, for his suggestion that a proposed mechanism of shattering of rocks due to release of pressure might be applied in explaining the formation of caves. The ideas in this article were stimulated by his suggestion.

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MACROEVOLUTION QUESTIONED

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*This article is intended as a critique of the whole doctrine of macroevolution, particularly as the doctrine is commonly presented at schools and colleges. The well known textbook, **Physical Anthropology**, by Lasker,¹ is cited to show how the doctrine is, in fact, presented. Citations from many authors show that practically every assumption of the macroevolutionary doctrine is, at best, questionable.*

It will be understood that this article is not intended as an attack on Lasker, nor on his book. Rather, it is a criticism of the doctrine which the author assumed in his book.

Introduction

The thesis to be maintained in this article is that the doctrine of evolution at the "macro" level is without real scientific support. I have no quarrel with "microevolution" (except, possibly, that the name is a bad one), the kind of change, for example, by which breeders develop toy poodles or juicier grapefruit. My objection is to the attempt to *extrapolate* these small changes into assumed *macroevolutionary* changes, by which fish supposedly became philosophers and random irrational particles were transformed into progressively more and more complex organisms.

Professor Lasker's, *Physical Anthropology*,¹ is a popular and widely used textbook. It accurately represents current evolutionary doctrine. For these reasons, I have chosen it as a vehicle for presenting my own contrary point of view.

The criticisms which follow, therefore, are directed, not at Professor Lasker, but at the doctrine upon which his book is based. As will become apparent, such criticisms are possible to a considerable extent because of the willingness of evolutionary thinkers to admit frankly that there are problem areas.

Obviously, all of the evolutionists quoted herein remain evolutionists, even while admitting the problems in their own fields. They sometimes assume that evidence from other fields nevertheless continues to support evolution, or that future discoveries will somehow vindicate the doctrine, despite the contrary facts which are known now.

I should suggest that when one considers the breadth and depth of the problems, he must agree that the entire doctrine is called into question. To the extent that this article raises questions, which is the main purpose, the careful reader will want to refer to the original sources to judge for himself whether the doctrine of macroevolution is adequate, or even reasonable.

One may begin, as Professor Lasker does, with the origin of life.

The Origin of Life

In the latter half of the seventeenth century Francisco Redi demonstrated that, contrary to what many believed, flies are not generated spontaneously from meat. Louis Pasteur proved the same for bacteria and sour milk in 1861. Nevertheless, spontaneous generation remains an essential ingredient in evolutionary doctrine.

What is the evidence? Professor Lasker says: "So far as we know, the naturally occurring organic compounds of today are the result of life processes: life seems always to depend on prior life." (p. 26) (Remember that in this context "organic" does not mean "living"; it simply refers to any compound containing carbon.)

Having thus disposed of the facts, Lasker goes on to speculate on pages 26-28: "Imagine, then, a time before there was life. Even if organic compounds were not being synthesized in cells, at least there would be no microorganisms to degrade such organic compounds as existed. Since there was nothing to cause compounds to decay, evolution would have caused compounds to become increasingly complex, not simpler . . ."

A few paragraphs later he adds: "In any case, constituents of the proteins and nucleic acids of living cells have been synthesized in the laboratory under primitive earth conditions. No one has yet come close to creating a living cell from primitive 'air', however, but the chemical steps have been shown to be plausible." (p. 32)

The "plausibility" of these steps should be considered in some detail. First of all, it is misleading to say that in the absence of microorganisms "there was nothing to cause compounds to decay". In the experiments which Lasker cites (Miller, Sagan and Khare, Wollin and Ericson, Stephen-Sherwood and Oparin) the amino acids and other simple compounds had to be removed quickly from the source of energy which produced them (electrical sparks or ultraviolet light) because the rate of destruction in the presence of these, or of any of the other proposed energy sources, far exceeds the rate of production.²

Even if it be assumed that these compounds could have been formed, and survived in the atmosphere long enough to reach the ocean, most of them would have been destroyed by water at ordinary temperatures. For example, Miller and Orgel have stated that: "The rates of depurination of DNA, of hydrolysis of peptide and polynucleotide polymers, and of decomposition of sugars, are so large that it seems impossible that such compounds could have accumulated in aqueous solution and have been used in the first organism, unless the temperature was low."³

Such low temperatures, however (Miller and Orgel prefer freezing or below) appear inconsistent with the evolutionary assumption that life formed soon after the earth cooled from a molten mass, while the oceans would still have been quite warm.

Moreover, these compounds are also destroyed by oxygen. Thus, proponents of spontaneous generation of life are forced to claim that the primitive atmosphere contained no oxygen. (See Lasker's Figure III-3, p. 26.) At present, the atmosphere is about 21% oxygen.

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It appears, though, that even if there were originally no oxygen, photolysis of atmospheric water vapor by ultraviolet light would have caused a significant amount of oxygen very early in the history of the Earth.⁴

Moreover, there is no evidence that the atmosphere ever contained methane,⁵ the gas most commonly used in experiments alleged to have to do with the origin of life. Ammonia, which is needed along with methane to produce the compounds, is also subject to rapid photolysis by ultraviolet light. It would have been reduced to concentrations much lower than those used in the experiments.⁶

Suppose, however, for the sake of argument, that amino acids could have formed. Could they have arranged themselves into "chains" to form proteins? Lasker says:

In attempting the abiogenetic synthesis of proteins, S. W. Fox (1960) was able to produce substances from amino acids that are in some ways like proteins. They are capable of assuming the shape of little uniform spheres that can be seen under the microscope. In some cases the electron microscope reveals differentiation and such cell-like characteristics as double-walled membranes in the droplets. (p. 33)

Sidney Fox produced these chains of amino acids by heating a pure, dry mixture of certain amino acids, usually from 6 to 10 hours at 170-200 °C, or for a week at 120°. After that he stirred in hot water, and then removed insoluble material by filtration. When the solution cooled, microscopic globules or "microspheres" containing the amino acid chains precipitated out. Fox claims that these "proteinoid microspheres" are stable and exhibit a kind of prebiological evolution. But Oparin says:

Fox's microspheres, since they are obtained thermally, do not present very promising results from this point of view (i.e., evolving to include metabolic processes). *Their structure is static.* This . . . creates many difficulties when it comes to converting them into dynamic systems which could be used for modeling the evolution of metabolism.⁷ (Emphasis added.)

Of course, Fox's experiments depend upon a supply of pure, dry amino acids, a requirement which, as has been noticed, seems impossible to fulfill. If such a supply were available, however, Fox has shown that it is possible under certain conditions to link amino acids together. He suggests that such conditions might have prevailed on the primitive earth on the edges of volcanoes. But Miller and Orgel are critical of this suggestion, pointing out that when lava solidifies, its surface is hardly warmer than the air. They add:

Another way of examining this problem is by asking whether there are places on the earth today with appropriate temperatures where we could drop say 10 grams of a mixture of amino acids and obtain a significant yield of polypeptides . . . We cannot think of a single such place.⁸

Of even more significance is Fox's contention that his polypeptides (chains of amino acids, shorter than proteins) are similar to proteins in the *order* in which the links are formed. The fact that even the simplest pro-

teins require a precise order in their amino acid links, and that the probability that such an order would occur spontaneously is virtually zero, has been a source of considerable dismay to supporters of spontaneous generation.

So far as is known, there is nothing about the physical and chemical properties of amino acids, nucleotides (the building blocks of DNA), and sugars, to indicate that polymerizations involving mixtures of any of them produce anything other than *random* sequences or structures. This randomness has been experimentally demonstrated by two of Fox's colleagues, Peter Mora and Gerhard Schramm, for polymerization of sugars,⁹ and of nucleotides.¹⁰

Fox's supposed contrary evidence for his amino acid chains has been criticized by Miller and Orgel, who accuse him of deception: "The degree of nonrandomness in thermal polypeptides so far demonstrated is minute compared with the nonrandomness in proteins. It is deceptive, then, to suggest that thermal polypeptides are similar to proteins in their nonrandomness".¹¹

One of the most puzzling facts of biology relates to this problem of order versus randomness. All but one of the amino acids found in proteins (glycine is the exception) may exist in two forms, designated D- and L- forms (sometimes called right- and left-handed). Chemically and physically they exhibit identical properties. (Except in certain optical properties, which would not seem to have anything to do with their biological use.)

Biologically, however, the difference is enormous; for all proteins produced in living cells contain exclusively the L- or left-handed form. All those produced artificially, however, contain random mixtures of D and L forms. The replacement of a single amino acid in a protein with its corresponding D form completely destroys all biological activity.¹² When all of this is considered, Fox's claim of non-randomness seems indeed questionable.

In view of the problems brought to light by the experiments mentioned, spontaneous generation appears less and less plausible. Consider the following figures, offered by Gerhard Schramm regarding the probability of random formation of one of the simplest forms of life (indeed, some question whether it should even be called a form of life) the tobacco mosaic virus:

The ribonucleic acid (RNA) of the tobacco mosaic virus (TMV) contains 6000 nucleotides. The probability that this special molecule results by random combination of the four nucleotides is $\frac{1}{4}^{6000} = 10^{-2000}$. Since the whole cosmos contains an estimated 10^{80} protons, it is practically impossible to obtain such a ribonucleic acid in 10^9 years, the age of the world, even if the whole world were to consist of a reacting mixture of nucleotides.¹³

Schramm and other spontaneous generation proponents attempt to get out of this dilemma by having some kind of "natural selection" for prebiological molecules. But since such molecules are not self-replicating, this is a contradiction in terms.¹⁴

Peter Mora is more forthright. Commenting on the common practice of evolutionists in relying upon "infinite escape clauses", such as that mentioned above, he says:

I believe we developed this practice to avoid facing the conclusion that the probability of a self-replicating state is zero . . . When for practical purposes the concept of infinite time and matter has to be invoked, that concept of probability is annulled. By such logic we can prove anything, such as that no matter how complex, everything will repeat itself, exactly and immeasurably.¹⁵

Mora properly suggests that the "illusion that the problem can be explained with existing knowledge" is a "dangerous mental attitude", and that we should "even dare to ask whether there is something special in the living, which cannot be treated by physics as we know it, but is still amenable to proof or disproof".¹⁶

Mutations

Even if the problem of spontaneous generation could be overcome, how would one kind of organism become a different, more complex, kind? Professor Lasker admits that: "The *only* way in which totally new possibilities arise is through change in the genetic material itself," i.e., by *mutations*. (p. 87.) It is surprising, therefore, to see him concede in the very next sentence: "it has been argued that mutations could have little to do with evolution because *those actually observed in the laboratory or in man are nearly always detrimental* (or at least neutral)". (p. 87.) (Emphasis added.)

Mutations are central to evolution, yet the observed facts again seem to contradict the doctrine. Lasker dismisses the problem, stating that "no one would claim that mutation alone produces evolution. It would do so chiefly in the presence of other factors, such as natural selection . . ." (p. 87.) But consider the following calculations by Sir Julian Huxley with respect to the presumed evolution of the horse. (And then multiply the result by the number of supposed evolutionary steps between the amoeba and man.):

A proportion of favorable mutations of one in a thousand does not sound much, but is probably generous . . . And a total of a million mutational steps sounds a great deal but is probably an understatement . . . However, let us take these figures as being reasonable estimates. With this proportion, but without any selection, we should clearly have to breed a million strains (a thousand squared) to get one containing two favorable mutations; and so on, up to a thousand to the millionth power to get one containing a million. Of course this could not really happen, but it is a useful way of visualizing the fantastic odds against getting a number of favorable mutations in one strain through pure chance alone. A thousand to the millionth power, when written out, becomes the figure 1 with three million noughts after it; and that would take three large volumes of about 500 pages each, just to print! . . . No one would bet on anything so improbable happening. And yet it has happened! It has happened, thanks to the working of natural selection and the properties of living substance which make natural selection inevitable!¹⁷

Natural Selection

Logically, then, the next subject is natural selection. Can natural selection really convert Huxley's (and Schramm's) impossibility into an inevitability?

As Lasker states on p. 19, a contrary kind of selection, normalizing selection, was recognized as a fact before Darwin's time: "This process, now called normalizing selection, in fact slows and stabilizes evolution by eliminating offspring which differ greatly from their parents". But he goes on to say:

It was the establishment of progressive evolution, however, and its firm foundation in the numerous facts established by Darwin and his followers, that produced a revolution in biological thought. Progressive evolution is the selection of changed offspring that are better adapted than their parents. (p. 20.)

Curiously, despite those "numerous facts assembled by Darwin and his followers", I find George Gaylord Simpson, who is perhaps the most influential evolutionary paleontologist, admitting of natural selection, in one of his books, "it might be argued that the theory is quite unsubstantiated and has status only as a speculation".¹⁸

Before I am accused of quoting Simpson out of context, let me hasten to add that Simpson's problem is not in proving that selection occurs, but in demonstrating that it has any effect on evolution. Professor Lasker offers the favorite example of evolutionists: the peppered moth (p. 94.). But as L. Harrison Matthews, Fellow of the Royal Society, states in the introduction to a recent edition of Darwin's *Origin of Species*:

The (peppered moth) experiments beautifully illustrate natural selection—or survival of the fittest—in action, but they do not show evolution in progress, for however populations may alter their content of light, intermediate or dark forms, all the moths remain from beginning to end, *Biston betularia*.¹⁹

Moreover, the peppered moths may not even demonstrate natural selection, which is no longer defined in terms of *survival*, but rather *differential reproduction*. (Glossary, p. 382.) The evidence is equivocal as to whether there has actually been an increase in the proportion of dark-colored moths being reproduced. Paul Ehrlich and Richard Holm report that in some experiments the expected deficiency of light-colored individuals was not found. In another experiment the results were inconsistent; while the offspring of some matings showed a significantly higher proportion of dark moths, the offspring from others did not.²⁰

Furthermore, in a recent article in *Scientific American* the author notes that "melanic (dark) moths remain common in areas where theoretically the birds should have exterminated them. Some factor may be counterbalancing the melanics' disadvantage, perhaps acting during the larval or pupal stages that make up most of the moths' life history. Complexities of this kind still remain to be investigated".²¹ It thus appears that barring total extinction of the whole species, the peppered moths will remain *polymorphic*.

But as Lasker points out on page 103, the existence of many polymorphisms is difficult to understand in terms

of natural selection. In fact some scientists, including King and Jukes (1969) whom Lasker cites, use polymorphisms and other evidence to argue that evolution must occur through "neutral" variations, which are neither advantageous nor disadvantageous, and thus "invisible" to natural selection. Lasker puts it mildly: "This is at variance with the theory of natural selection". (p. 103.)

Harvard's Stephen Jay Gould, summarizing these viewpoints, is more worried: "But something even more fundamental is threatened, namely Darwinism itself".²² It would seem that the evidence from the peppered moths supports this last viewpoint as much as it supports the view that natural selection is important.

Darwin was well acquainted with the changes in domestic plants and animals achieved by artificial breeding; and he supposed that it was legitimate to extrapolate them:

Slow though the process of selection may be, if feeble man can do so much by his powers of artificial selection, I can see no limit to the amount of change, to the beauty and infinite complexity of co-adaptations between all organic beings, one with another and with their physical conditions of life, which may be effected in the long course of time by nature's power of selection.²³

But over 100 years after Darwin, all *experimental* evidence indicates that *variation is confined within limits*.

For instance, the much-publicized experiments on fruit flies, by mutations induced artificially, and *artificial* selection, resulted in considerable variability. But attempts to push these variations beyond certain limits lead to mass sterility and death. Attempts to hold the variations near their limits led to reversion to the norm. A leading evolutionist, Ernst Mayr of Harvard, regards these results as entirely normal:

Obviously any drastic improvement under selection must seriously deplete the store of genetic variability... The most frequent correlated response of one-sided selection is a drop in general fitness. This plagues virtually every breeding experiment.²⁴

Mayr continues to believe that major changes are possible, but he cites no observed cases, and concedes that "much of this is obviously speculative".²⁵

Not only is there a disconcerting paucity of evidence; it appears also that evolutionists have been unable to come up with a workable definition of natural selection. "Natural" means "not artificial"; that much is clear. "Selection", according to Lasker, means "that there are biological variants favorable in terms of the circumstances under which their selection occurs". (p. 92.) Aside from the fact that this definition assumes its own conclusion, i.e. that selection *does* occur, the problem is in objectively determining which variants are *favorable* in terms of the circumstances of their occurrence.

Another leading evolutionist, G. Ledyard Stebbins, now at the University of California, Davis, has admitted:

Obviously... a final estimate of the importance of selection in evolution must depend largely on determining what... differences are... adaptive

... Unfortunately, however, the determination of the adaptive character of many types of differences between organisms is one of the most difficult problems in biology.²⁶

We can, therefore, do little more than speculate.²⁷ Mayr agrees: "... one can never assert with confidence that a given structure does not have selective significance."²⁸

Simpson regards this as a matter of common knowledge: "The fallibility of personal judgements as to the adaptive value of particular characters, most especially when these occur in animals quite unlike any now living, is notorious."²⁹

In fact, most evolutionists now agree that "fitness" cannot be objectively analyzed. Thus Lasker cautions, "Fitness is defined by the test of survival, not by 'fitness' in some evaluative human sense." (p. 92.) That is to say, those who survive are the fittest because the fittest are the one who survive. This is a tautology: a logical fallacy that explains nothing.³⁰ With this kind of definition it is easy to see how natural selection can simultaneously "explain", in Lasker's example, the evolution of both early and delayed parturition and weaning in mammals. (p. 93.)

The shortcomings of mutations and natural selection as mechanisms of evolution have led to a recent emphasis on random genetic drift coupled with fluctuations in the sizes of populations. (See Lasker, pp. 107-118.) But since genetic drift alone cannot produce anything other than the same kind and level of organism, this emphasis seems unjustified. Those interested may wish to read Mayr's short history of the concept of genetic drift and a review of many untenable applications.³¹ Mayr apparently still believes that there may be a role for genetic drift in evolution. But he appears to have doubts about the role of other random mechanisms:

Random phenomena like recombination... and the founder principle introduce a considerable degree of indeterminacy into evolution. Temporarily they may be even stronger than selection in completely isolated and at least initially small populations. How important such populations are for speciation and ultimately for evolution is still rather obscure.³²

Evolutionists are faced with a dilemma here. For the greater the role assigned to random processes, the smaller are the chances that Huxley's impossibility will be converted into an inevitability by natural selection.

I believe that I have raised substantial questions about the "evidence" that any known biological mechanism can produce macroevolutionary changes. It is commonly assumed, however, that despite the shortcomings of the explanatory mechanisms, the fossil record provides clear evidence for macroevolution. So the fossils may now be considered.

Gaps in the Fossil Record

Lasker states: "There is now much fossil evidence for all sorts of intermediate forms that show the nature of man's relationship to other animals, and new finds are being added continuously... Our problem is not in finding missing links as such." (p. 18.)

Actually, the problem initially is one of semantics. As Lasker later states: "One cannot properly speak of missing links and known links in evolution because evolution runs in lines rather than chains and it is always possible to refine one's knowledge as more points on the line become known and the unknown segments between them become smaller." (p. 242.) He is saying, in other words, that since evolution occurs on a continuum, with innumerable points, one cannot expect to find all of the intermediate forms in a given line.

Of course, once one presupposes an evolutionary continuum, the distance between presumed intermediate ancestral forms presents, as Lasker states, no "problem".

No one has ever asked that all of the fossils of all of the individuals in an alleged line of descent be produced. But it does seem reasonable to ask that a series be produced, in which each one does not differ very much from its neighbor. Whatever may be presupposed, the fact is that the gaps in the fossil record, between allegedly related forms, are large and systematic.

Simpson has stated: "It is a feature of the known fossil record that most taxa appear abruptly . . . Gaps among species are sporadic and often small. Gaps among known orders, classes and phyla are systematic and almost always large".³³

Another paleontologist, T. Neville George states: "There is no need to apologize any longer for the poverty of the fossil record. In some ways it has become almost unmanageably rich, and discovery is outpacing integration. . . . The fossil record continues to be composed mainly of gaps."³⁴

In a recent article in *Evolution*, a paleontologist at the University of Oklahoma says:

Despite the bright promise that paleontology provides a means of "seeing" evolution, it has presented some nasty difficulties for evolutionists the most notorious of which is the presence of "gaps" in the fossil record. *Evolution requires intermediate forms between species and paleontology does not provide them.*³⁵ (Emphasis added.)

So great are the gaps that the presumed ancestral relationships are highly arbitrary. Mayr, who is one of the leading American taxonomists, says:

Most taxa above the family level are sharply delimited. Mollusks, penquins, beetles, and indeed most higher taxa are separated from their nearest relatives by a decided gap, far more so than most genera and families. Nevertheless it remains true that the higher categories in which we place these taxa are ill-defined . . . (No) yardstick has yet been found for the non-arbitrary ranking of taxa . . . It is in the arbitrariness of definition that all higher categories differ from the species category.³⁶

A reviewer of Mayr's book says that "nearly all biologists must share the view that the species is the only taxonomic category that has, at least in more favorable examples, a completely objective existence. Higher categories are all more or less a matter of opinion."³⁷

In this regard, Lasker's discussion of *parallelism* and *convergence* (p. 200.), and *homology* and *analogy* (p. 205.) is instructive. He gives numerous examples of quite similar forms of life which are nevertheless shown

by other evidence to be unrelated in ancestry. If this is true (and all evolutionists agree that it is), it casts doubt upon any attempt to draw conclusions about ancestry from structural or other similarities in the fossil record. But macroevolution is built upon these similarities; so anything which casts doubt upon group similarities must cast doubt upon the entire doctrine.

There is one group of fossils, however, that is repeatedly referred to whenever the question of gaps is raised: the horse series. It appears in virtually every book on the subject of evolution. Yet, according to Simpson, "this usual example has been badly misrepresented."³⁸ Garrett Hardin points out that an early exhibit at the American Museum of Natural History purporting to show straight-line evolution in horses was widely photographed before its erroneous nature was pointed out; and these misleading photographs still appear in some textbooks.³⁹

Lasker shows the fossils correctly in a diagram on page 207. Note that despite the "abundant fossil material" only *three* fossils are thought to be ancestral to *Equus*, the modern horse: *Eohippus*, *Miohippus*, and *Merychippus*.

Simpson, upon whom Lasker relies for his diagram, is probably the greatest authority on the horse series. Consider Simpson's own statements:

Every feature of horse evolution tells a comparably complex story if this is examined in detail and in all the divergent lines of the horse family. The feet . . . hardly evolved at all in the Eocene, then *evolved rapidly* to a basic three toed Oligocene type which *remained nearly static* in some later lines . . . and in one line only finally *evolved rapidly in one phase* to a one-toed type. This again, did not really continue the usual trend among the three-toed types but was a new evolutionary direction for them. In the particular lineage from *Eohippus* to *Equus*, general foot mechanics became first more complex, then simpler. The number of toes did not change at even pace from four (in the forefoot) to one, but changed in two spurts, first from four to three, then much later from three to one, each rapid transition followed by slower mechanical adjustment to the new sort of foot and to changes in the weight of the animals.

The horses even provide us with exceptions to the rule that animals tend to increase in size in their evolution. In fact, the known late Eocene horses average rather smaller than *Eohippus* in the Eocene. Then still later, in the Miocene and Pliocene, there were *at least three different branches of the horse family* characterized by decrease in size . . . while at the same time others were, according to the "rule" increasing in size. At that time, too, others were fluctuating around a mean size without notable change and still others developed different species of decidedly different sizes—as, indeed, is the case in *Equus* today.⁴⁰ (Emphasis added.)

Given this kind of evidence, one need only add Simpson's own statement, "You can establish any 'rule' you like if you start with the rule and then interpret the evidence accordingly."⁴¹

As Lasker's (Simpson's) diagram shows, to follow even the three presumed stages requires a geographical leap from the Old World to South America. Moreover, the placement of *Eohippus* (more broadly called *Hyracotherium*), as the first link in the series, is highly arbitrary. In an earlier article, Simpson said:

Matthew has shown and insisted that *Hyracotherium* (including *Eohippus*) is so primitive⁴² that it is not much more definitely equid than taprid, rhinocerotid, et cetera, but it is *customary* to place it at the root of the equid group.⁴³ (Emphasis added.)

The rest of the fossil record offers little comfort to macroevolutionists. Simpson says that there is a considerable gap between *Eohippus* (*Hyracotherium*) and its supposed ancestral order. He then goes on to say:

This is true of *all* of the thirty-two orders of mammals . . . *The earliest and most primitive members of every order already have the basic ordinal characters*, and in no case is an approximately continuous sequence from one order to another known. In most cases the break is so sharp and the gap so large that the origin of the order is speculative and much disputed.⁴⁴ (Emphasis added.)

This *regular absence* of transitional forms is not confined to mammals, but is an *almost universal phenomenon*, as has long been noted by paleontologists. It is true of almost all orders of all classes of animals, both vertebrate and invertebrate. *A fortiori*, it is also true of the classes, and of the major animal phyla, and it is apparently true also of analogous categories of plants.⁴⁵ (Emphasis added.)

There is . . . a tendency toward systematic deficiency in the record of the history of life. It is thus possible to claim that *such transitions are not recorded* because they did not exist, that the changes were not by transition but by *sudden leaps* in evolution.⁴⁶ (Emphasis added.)

A few evolutionists have accepted the gaps in the fossil record at face value, and assert that the major categories must have arisen by "macrogenesis", or systemic mutation, rather than the millions of small steps ("phyletic gradualism") proposed by virtually all others.⁴⁷ The most prominent of these was Richard Goldschmidt, of the University of California at Berkeley, who used the term "hopeful monster". Goldschmidt's book contains a valuable critique of other evolutionary ideas.⁴⁸ Speaking of Goldschmidt's concept, however, Mayr says:

The occurrence of genetic monstrosities by mutation, for instance the homeotic mutants in *Drosophila* (fruit flies) is well substantiated, but they are such evident freaks that these monsters can be designated only as "hopeless". They are so utterly unbalanced that they would not have the slightest chance of escaping elimination through stabilizing selection. . . . to believe that such a drastic mutation would produce a viable new type, capable of occupying a new adaptive zone, is equivalent to believing in miracles.⁴⁹

Simpson also attacks this view, which depends upon multiple, simultaneous mutations:

The chances of multiple, simultaneous mutations seem to be even smaller, indeed negligible. Postulation of a mutation rate of .00001 and of each mutation's doubling the chances of another in the same nucleus would correspond with the most favorable circumstances warranted by laboratory evidence. Under these postulates, the probability of five mutations in the same nucleus would be approximately 10^{-22} . With an average effective breeding population of 100 million individuals and an average length of generation of one day, again extremely favorable postulates, such an event would be expected only once in about 274 billion years, or about a hundred times the probable age of the earth. Obviously, unless there is an unknown factor tremendously increasing the chance of simultaneous mutations, *such a process has played no part whatever in evolution*.⁵⁰ (Emphasis added.)

Stratigraphic Position

One argument used by macroevolutionists to avoid confronting the gaps in the fossil record is the assertion that the layers of the geologic column at least demonstrate a broad progression from simple to complex forms of life. But the fossil record is full of inconsistencies on this issue. Simpson may be quoted once again:

Most (phyla) . . . begin in the Cambrian . . . (until recently thought to be the strata in which life first evolved). There is little logical order in time of appearance. The Arthropoda appear in the record as early as do undoubted Protozoa, although by general consensus the Protozoa are the most primitive phylum and the Arthropoda the most "advanced"—that is, structurally the most complicated—among the nonchordates (or invertebrates, as all the phyla other than the Chordata are often called). Corals and bryozoans do not appear until the Ordovician, although they are less highly organized than many groups that do occur in the early Cambrian . . . (The phylum Chordata) is to be considered in some sense the most progressive of all the phyla, and it is indeed the last to appear in the record, although not much antedated by the lowly bryozoans.⁵¹

The fossil record is so equivocal, in fact, that three prominent paleontologists recently concluded that stratigraphic position should not even be considered in making the initial determination of phylogeny (line of supposed evolutionary descent):

It is our opinion that the spectrum of primitive-derived character states, or polarity, must be worked out (and, in fact usually is worked out), at least initially, on the basis of morphologic criteria. (Rather than time-sequence criteria.) The reason for this conclusion is that the sequence in the rocks may not offer a true picture of polarity. *Primitiveness and apparent ancientness are not necessarily correlated*.⁵² (Emphasis added.)

The chronocline (time sequence) concept implies, wrongly, we believe, that the temporal sequence is, in itself, meaningful in evaluating relationship.⁵³

These same writers point out that one of the problems with reliance upon stratigraphic data is that the

question of time sequence is often decided on the basis of the fossils; and thus the whole argument is circular: "The prime difficulty with the use of presumed ancestral-descendant sequences to express phylogeny is that biostratigraphic data are often used in conjunction with morphology in the initial evaluation of relationships, which leads to obvious circularity".⁵⁴

But at least as damaging to the idea that fossil sequences such as the horse demonstrate progressive evolution is the assertion that:

All organisms are bound to be relatively primitive in some respects, and relatively derived in others (the concept of mosaic evolution: DeBeer, 1954). The probability of finding a fossil taxon that is primitive in all respects to another, younger taxon, is small.⁵⁵

In fact, Schaeffer and his colleagues say that if one were to consider only the relative "primitiveness" of the horse fossils, the sequence could just as easily be *Equus-Hyracotherium* as *Hyracotherium-Equus*.⁵⁶

Supposed Ancestors of Mankind

Finally, consider the fossil ancestors of mankind. Lasker follows current thinking, and places the supposed evolutionary ancestors of man into three categories: (1) *Australopithecus*, (2) *Homo habilis*, and (3) *Homo erectus*. The latter category includes the famous "Peking man" and "Java man" fossils, as well as a number of others. (p. 263.) Not included at all, of course, is Neanderthal Man, whom virtually all evolutionists now include in *Homo sapiens*. (p. 292.)

At just the time that Lasker's book was being written in 1973, however, Richard Leakey and others discovered new fossils in Africa that have virtually eliminated the first category, *Australopithecus*, as an ancestor of man. In Leakey's own words, his Skull 1470 "leaves in ruins the notion that all early fossils can be arranged in an orderly sequence of evolutionary change."⁵⁷ Leakey now views *Australopithecus* as "ape-like", and "probably a relative rather than a forebear of mankind".⁵⁸

The reason for Leakey's dramatic statements is that Skull 1470, except for its small size, about 800 cc., is apparently more "modern" in form than that of any of the heretofore supposed ancestors of man. For instance, the sloping forehead and prominent brow ridges of *Homo erectus* fossils are not present in Skull 1470.⁵⁹ Yet Skull 1470 is said to be about 1.8 million years old; a contemporary of *Australopithecus*, and older than any *Homo erectus* fossil.⁶⁰

Lasker discusses Skull 1470 on pages 264-267, basing his remarks on Leakey's early reports, and states that it is possible to conclude that 1470 is "true man". "In any case, those who believe there has been a long history of true men have a new fossil candidate to honor . . ." (p. 265.) Ralph L. Holloway, Jr., an anthropologist at Columbia University, has concluded that 1470 "was capable of some kind of human language" because the skull has "a bulge known as Broca's area that is lacking in apes but present in man and is considered a speech center".⁶¹

Despite its modern configuration, Leakey views Skull 1470 as an ancestral link to man because of its small

brain size. But Stephen Molnar, an associate editor of the *American Journal of Physical Anthropology*, after commenting on the "usefulness" of comparing cranial capacities in fossils, makes the following rather startling comments:

In modern populations . . . there is such a wide range in variation that the lower end of the range is well below the capacity for certain fossil hominids, yet there is no evidence that these individuals are any less intelligent than persons with larger cranial vaults. It is unlikely that the differences in modern population brain size have any relevance to variation in mental ability—a factor that renders comparisons of cranial capacity between modern groups a futile and meaningless exercise. As Von Bonin (1963), a foremost neuroanatomist, once stated, the correlation between brain size and mental capacity is insignificant in modern man. A good example can be seen in the case of females who have, on the average, 10 percent smaller cranial capacities than males; no one has dared suggest that this indicates lower mental capacity. Also, many famous men in history have, upon their deaths, had their brain weighed and measured; and the ranges encompassed the total range of *H. Sapiens*, from Anatole France (cranial capacity of approximately 1100 cc.) to Oliver Cromwell and Lord Byron (cranial capacity of approximately 2200 cc.) . . . Variation of plus or minus 400 cc. about the mean is seen in most European populations. These individuals with larger or smaller cranial capacities are normally functioning and intellectually competent individuals; *in fact, there are many persons with 700 to 800 cubic centimeters*.⁶² (Emphasis added.)

If brain size means nothing for modern populations, is it not fair to suggest that it means nothing for fossil populations also? For all practical purposes, Leakey's Skull 1470 eliminates any imagined evolutionary ancestry of mankind.

The broader question aside, other anthropologists are coming to agree with Leakey's elimination of *Australopithecus*. David Pilbeam and Stephen Jay Gould, two prominent experts, using allometric techniques,⁶³ and Charles F. Oxnard, anatomist and anthropologist at the University of Chicago, using a computerized multivariate analysis technique,⁶⁴ have concluded that *Australopithecus* was not ancestral to man. So *Australopithecus* is rapidly on its way to being disinherited as man's ancestor.

The *Homo habilis* category was first proposed by the late Louis S. B. Leakey (Richard Leakey's father) in 1961. As Lasker indicates, the separate status of that category has been in doubt from the beginning:

Some students of the problem believe that the degree of variation in size from one group of teeth to another (or in a particular tooth from one dimension to another) seen between *Australopithecus* and *Homo habilis* occurs only between species. Others (see for instance Brace et al., 1971) call attention to the fact that the size of teeth can vary greatly within a species. (p. 264.)

Recently Brace and Wolpoff, both anthropologists at the University of Michigan, made the following comments in response to the article by David Pilbeam and Stephen Jay Gould, cited in reference 63 above:

The very existence of the taxon *Homo habilis* owes more to an extraordinarily wide press . . . than to actual data . . . Pilbeam now agrees with us in believing that the dental variation in the *Australopithecines* is so great that jaws and teeth alone are of no use in distinguishing taxa, a conclusion recently emphasized by the discovery of a Rudolph cranium with a 500 cc. brain and very small teeth (ER 1813).

The sample which Pilbeam is now willing to attribute to *Homo habilis* consists of only four specimens . . . There is no specimen with both known brain size and known tooth size . . . There is not a single Lower Pleistocene cranium with a known cranial capacity that is associated with any postcranial material useful in determining body size . . . This is true also of *Homo erectus* . . . The varied use of the taxon has created nothing but confusion. Hence we reiterate the previous suggestion that "*Homo habilis* be formally sunk".⁶⁵

This leaves only *Homo erectus* to fill the gap between mankind and non-human beings. But there is no evidence for macroevolution here, for consider Lasker's statement: "Only one or two of these fossils fall outside the range of a small series of American White subjects." (p. 284.)

Given the range of variation among world populations, can it be said that *Homo erectus* has any meaningful evolutionary significance? S. M. Garn (upon whom Lasker relies) "considers the increased size of the *Homo sapiens* cranium to be significant" (p. 284), but as has been seen, such differences appear meaningless, particularly in light of the fact pointed out by Brace and Wolpoff, above, that we are ignorant of the body size of all *Homo erectus* skulls.

If brain size is significant, how does one account for Neanderthal Man? In explaining the large cranial capacity of some Neanderthal specimens (1.75 liter vs. 1.30 to 1.45 liter for the average modern European) Lasker finds it necessary to caution that "it is unwarranted to assume that Neanderthal man was in general significantly more brainy than subsequent man." (p. 291.)

Conclusion

The arguments for macroevolution fail at every significant level when confronted by the facts. The origin of life, mutations, natural selection, and the fossil record all fail to support the doctrine.

Why then do evolutionists continue to assert that evolution is a *fact*? The answer is that evolution has been *defined* by some authors in such a way that it is a fact. Lasker gives a common definition of evolution: "A continuous change over generations in frequencies of genetically determined characteristics." (p. 376.) Thus he can say that any change in gene frequency, for example "between father and son" is evolution.

Lasker says that evolution "is a *lawful* change in the genetic composition of the members of a population."

(p. 16. Emphasis added.) In so doing, he and other evolutionists include the laws of heredity within the definition of evolution. But this can only lead to confusion, for as Theodosius Dobzhansky says:

All living things grow and reproduce their like . . . This process of self production, of like begetting like, is the essence of heredity. *Heredity is . . . the antithesis of evolution* . . . Evolution is a process which makes the descendants unlike their ancestors.⁶⁶ (Emphasis added.)

This kind of non-definition should be discarded. The "neo-Darwinian synthesis" notwithstanding, the science of genetics has made it unnecessary to account for variability in evolutionary terms. Consider the following statement by Gould:

. . . there is far more genetic variability within natural populations than the classical school could possibly allow—and even more than many field geneticists ever dared to imagine. In several organisms, more than half the tested genes exist in alternate alleles within a population, while individuals may be variable in up to 25 percent of their genes (although 5 to 15 percent per individual is the usual range).⁶⁷

Thus what has been taken to be evidence of macroevolutionary changes may turn out to be simply normal genetic variation. And, as I have tried to show, there is no evidence, from either the fossil record, observations of nature, or biological experiment, that these variations can extend across natural genetic limitations and produce macroevolutionary changes.

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I am indebted to the following sources for many of the ideas expressed herein. They are recommended to those who wish to pursue the subject further:

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First	Second	First	Second
16	12	118	119
19	17	200	196
20	17	205	199
24	20	207	201
26	21 and 24	242	235
28	22	263	262-267
32	23	264	255-258
33	24	265	259
87	89	267	259
92	94	284	276
93	94	291	281-282
94	95	292	283
103	105	376	368
107	108	382	374

It may be noticed also that in the second edition, the statement referred to on p. 103 of the first edition is omitted. Instead, on p. 105 of the second edition, is this statement: "Some students of molecular genetics believe that non-Darwinian evolution of this kind is an important aspect of evolutionary change".

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¹⁰Schramm, Gerhard. Synthesis of nucleosides and polynucleotides, *Ibid.*, p. 307.

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¹⁶*Ibid.*, pp. 50 and 51.

¹⁷Huxley, Julian 1953. *Evolution in action*. Harper and Brothers Co., New York, p. 41.

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²⁵*Ibid.*, pp. 586, 613 and 615.

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⁴⁰Simpson, G. G., reference 38, pp. 133-136.

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⁵⁹For a more complete description of Leakey's finds see Leakey, Richard 1974. Further evidence of Lower Pleistocene hominids from East Rudolf, North Kenya, 1973, *Nature* 248(5450):653-656; also Leakey, Richard 1973. Evidence for an advanced Plio-Pleistocene hominid from East Rudolf, Kenya, *Nature* 242(5398):447-450. (See

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⁶⁰The age of this skull is somewhat controversial. Leakey's figure is 2.6 million years, based upon potassium-argon dating of a layer of volcanic tuff. The figures $1.60 \pm .05$ MY and $1.82 \pm .04$ MY were obtained by the same method at the University of California, Berkeley. (See also Curtis, G. H., T. Cerling Drake, and Hampel. 1975. Age of KBS tuff in Koobi Fora formation, E. Rudolf, Kenya, *Nature* 258 (5534):395-398.)

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PANORAMA OF SCIENCE

Ancient Astronomy in Western Hemisphere

For a long time scholars have known that some natives of the Western Hemisphere, such as the Mayas, had a considerable knowledge of astronomy before the time of Columbus. Now there is evidence to show that such knowledge was quite widespread. Also, such knowledge seems to have led to the building of structures for astronomical purposes. There is evidence of such structures all the way from near what are now St. Louis and Wichita to Peru.¹

Some of these monuments are in the form of towers, in Yucatan for instance, and at the Casa Grande National Monument, near Coolidge, Arizona. Others seem to have been something like Stonehenge, and similar circular structures, which Thom and others have recently maintained had astronomical uses.² Some of this latter kind may have been made of wood; naturally a wooden one would leave few remains after all these years.

So there seem to be ancient astronomical structures, and astronomical knowledge, scattered all the way from the Middle East to the Americas. To what is such a wide distribution to be ascribed? The following explanation is suggested.

Some time between about 2400 B. C. and 2000 B. C., according to a straightforward reading of Genesis, there was a concentrated, highly advanced civilization in what was later called Babylonia. These people began to build some kind of huge center at Babel. Maybe it was intended as a sort of rallying-point for all people, something like what Delphi and Olympia were later to the Greeks.

In some way, these plans were contrary to God's will. It may be that the fault lay, not in any use intended for the structures, but in the attitude of the builders: that attitude of overweening pride which the Greeks called *hubris*. The question, whether *hubris* may be found in the world today, may be left to the reader's consideration.

The tower of Babel may not necessarily have been a tower like a lighthouse. Also, the Hebrew may not say

exactly that the top was to reach to the heavens; but it had something to do with the heavens.

It is suggested, then, that the tower was some kind of astronomical structure. There are several possibilities as to its intended use. Some have suggested that the present system of seasons began only after the Flood. If so, maybe it was intended to make observations to determine the seasons for sowing, etc., and more generally for purposes of a calendar. It may be noteworthy, in this connection, that the calendar of the Hebrews, although it had lunar months, was not tied in to the behavior of any star, e.g., to determine the beginning of a year, but rather to climate and growth.³

Again, it may be that people then feared another Flood, and that they thought that astronomical observations of some kind might provide a warning against a Flood. This would be a bit analogous to the view, common in the last century but apparently abandoned nowadays, that the (alleged) ice age was to be explained by astronomical causes.⁴

There is another possibility. It seems to be an old idea that the motions in the heavens are tied in with somehow, and even control, happenings on Earth. Men as intelligent as Aristotle⁵ and St. Thomas Aquinas⁶ seem to have believed that there might be something in this notion. Is it possible, then, that the builders of Babel proposed, in their observatory, to follow and imitate the motions of the stars and planets, maybe by moving markers around, or by holding processions? In that way, it could be, they proposed to participate in the activity of the heavens, with beneficial results to themselves.

The Tower of Babel, then, it is suggested, may, in part, have been something like Stonehenge. It may well have incorporated one or more towers, in the narrower sense of the word.

There may have been a reason for a huge size. Thom and others have suggested that observatories such as Stonehenge often depended on such points as the tops of distant hills as sights for the observations. In the plains of Babylonia, there may have been few suitable hills

available; artificial distant sights may have been built, or at least intended. The plans may have called for a huge complex.

Anyway, God confused the builders' language. The process may well have happened over a good many years. There is evidence for the disruption which comes about when languages change, in the disruption which happened between say 500 and 800 A. D., when Latin broke up into various languages. As for how the change of language led to a dispersion of people, one need only think of a French Canadian, who might well move away in disgust if his home town began to be English-speaking.

Many, at least, of the dispersed people moved westward, some as far as North and South America. The question, whether there was an easier way then than now to cross the Atlantic, needs more investigation. These people, as they dispersed, took at least remnants of their technology and way of life with them. And these remnants included the construction of structures with astronomical uses, which are found in many places in the Western Hemisphere.

One other thought. Is it possible that a structure something like Stonehenge, used for religious purposes as has been proposed, had to do with the design of the classical Greek temple? (Some of the dispersed people, of course, having settled in Greece.) After all, what is the purpose of pillars all around the building? The walls could easily have supported the roof. Could the pillars have originally have been in a circle, as at Stonehenge? Then a wall was added inside them, to protect whatever was kept in the temple, as the structure became; and then, because of the climate, a roof was added. Later, as the astronomical origin was forgotten, the shape changed from round to rectangular. There may not, of course, have been actual structures according to all these stages; but this may be the logical process of development.

Clearly, there is room for much more investigation here.

Evidence of Cyclic Variations in Tree Rings

The question of the reliability, or otherwise, of tree rings as indicators of age is one of much interest. Some findings, reported in *Nature*, are informative. Scot pines, planted in 1883, showed cyclic variation in the width of the rings, and these variations seemed to be correlated with variations in rainfall and temperature.⁷

The importance, for use in chronology, of finding whether there are cyclic or periodic variations is apparent. Suppose, for instance, that there should be a variation with a period of 11 years, related, it may be, to sunspots. Suppose, thus, that there were unusually narrow rings in the years 1, 12, 23, . . . , 133, 144, . . . , etc. In attempting to match the rings from two samples, it might be that the ring from 1 in one sample would be matched, or, rather, mismatched, with that from 144 in the other. Thus an error would be introduced.

It is true that there are certain precautions which can be taken against such mismatching. But it seems that there must remain a certain danger; and, as long as it does, results obtained by matching rings need to be received with a certain amount of caution.

May Plants Take up Isotopes Preferentially?

Researchers report that the contents of stable isotopes of hydrogen and oxygen, in the wood of trees, may vary from one ring to another; and the amounts of isotopes are related to the temperature at the time when the particular ring grew. The evidence was obtained by measuring the proportions of the isotopes in the various rings, extending back as far as there have been records of temperatures, and comparing the proportions with the recorded temperatures.⁸

Since there appears to be a relation, and that relation can be determined, scientists propose to extend the work, and to find out from ancient tree rings something about temperatures before there were any records of the weather.

One may ask: if the proportions in which the trees take up the isotopes of hydrogen and oxygen vary with the temperature, is it not likely that a similar effect will occur with other isotopes? And in particular, is it not likely that something of the sort would happen with carbon 14? It does not seem likely that the fact that it is not a stable isotope, as the others were, would make any difference.

If the effect which has been suggested turns out to be what actually happens, it will be yet another reason why dates and ages, supposed to be established by carbon 14, need to be taken with some caution. And they need not be accepted at all if they are contradicted by other reliable information, such as that from Scripture.

Mammoths 4,000 Years Ago?

The relic called the Holly Oak pendant, found near Holly Oak, Delaware, about 1864, has attracted much attention. The surprising thing (surprising, that is, to many) is that an image drawn on it quite clearly represents a mammoth.

In a recent discussion one author remarked on the "... possibility of a very late occurrence of the woolly mammoth in eastern North America . . .", in discussing the evidence provided by this pendant. In the context, "very late" meant less than about 4,000 years ago.⁹

Such a thing would not be particularly surprising to a creationist who believes that mammoths lived at least until the Flood, and maybe some of them afterwards. Conversely, relics such as this may provide some evidence about the Flood, and about what happened not too long afterwards.

On the Dispersion of Pollen

Fossil pollen, while it is of interest to geologists generally, is especially so to creationists; for it has been used to show that plants, considered to be modern, were living when the rocks called Cambrian were laid down. Often pollen of this kind is dispersed by the wind; so it is of some interest to know how far it may be carried.

Apparently, in fact, pollen may be carried a long way. It is reported in *Nature* that pollen has been carried, presumably by the wind, from Scandinavia to the Shetland Islands, and from Australia to New Zealand.¹⁰

Clearly, such findings do not affect the conclusions drawn by creationists: that the plant materials in rocks called Cambrian (for instance), are not different from modern plants. But they will be of great importance when the time comes to trace the distribution of the plants from which the pollen came.

Can Man be Older than his Ancestors?

I remember a comic song, in which a man, because of a peculiar series of marriages, concluded that he was his own grandfather. It would appear that a somewhat similar situation has arisen in regard to the alleged evolution of the human race.

It has been maintained that such creatures as the *Australopithecus* were ancestors of true men. But within the last few years human remains have been found which were said to be older than those of the alleged ancestors. Creationists know that all of these reported ages are likely exaggerated; but they will have no difficulty in agreeing that man is as old, at least, as any of the alleged ancestors. In that sense, they will agree that the evidence "... clearly suggests considerable antiquity for the human line ...".¹¹

In fact, is it not likely, if such creatures as *Australopithecus* were not simply a kind of ape now extinct, that they were degenerate men: descendants, not ancestors, of mankind?

More on Illusions in Geology

As mentioned recently in this column, certain studies have shown that it is easy for geologists to be deceived by illusions in their investigations; and to see, or at least report, what they think should be, rather than what actually is. Now another report on these matters, with similar conclusions, has been published.¹²

Let it be said again that in this respect geologists are likely no better and no worse than anyone else. Everyone tends to observe what he thinks he should observe. And there are examples from other sciences: for instance, the canals which many observers thought for many years that they could see on Mars.

However, the lessons for creationists are plain. In the first place, they should strive to make their own observations as free of bias as possible. In the second place, when they encounter any observation, or reported observation, which might seem useful against Creationism, they are entitled to ask that the observation be re-examined, if possible, to see if it is really accurate.

Political Origin of Uniformitarianism

In a recent article in the journal *Kronos* the author expounds an interesting view of the rise, around the beginning of the nineteenth century, of uniformitarian geology. It is maintained that Lyell and others, although they presented their work as disinterested scientific study, actually had ulterior motives: their work was actually intended to support political liberalism. The author says that "... the whig scientists ...

did not want the public to know that that which was being promoted as objective truth was little more than thinly disguised political propaganda."¹³

The notion behind these endeavors, the author maintains, is that, in order to uphold political liberalism, the liberals considered that it was necessary to play down the fact that God is Creator and Ruler of the universe. And to do so, uniformitarianism was the obvious doctrine to proclaim. In fact, there is, of course, no real conflict between Creationism and democratic principles; but these people apparently thought that there was. As the author remarks, the political argument is long since over; but the world is left with the scientific (or pseudo-scientific) dogma.

There is some interesting information in the article about the early years of the London Geological Society, which was very active in promoting uniformitarianism. One point offered is that, at the beginning, almost all of the members of that Society were "armchair" geologists, with no field experience.

Volcanoes and Glaciers: a Connection?

According to certain studies the action of volcanoes may have an effect in triggering glaciation. The cause might be, in part at least, the dust thrown into the air during volcanic eruption.¹⁴

If there was an ice age, and if, as many creationists believe, it came after the Flood, there might be a clue here. The breaking up of the fountains of the great deep, many believe, consisted of, or was accompanied by, volcanic eruptions. Enormous amounts of dust might have been thrown out, and it might have had an effect on the climate for some time thereafter.

— Contributed by H. L. Armstrong

Sunken Ships Form Undersea Garden

The *National Geographic* for May 1976 has a fascinating article, "Life Springs from Death in Truk Lagoon."¹⁵ About 60 Japanese merchant and warships, now at the bottom of Truk lagoon, were sunk by the February 17, 1944 air attack of the United States Navy. These ships constitute the world's largest collection of artificial coral reefs of precisely known age. Hence they offer invaluable clues to the growth rates and patterns of marine life that are found in submerged reefs.

Two deep sea divers, Sylvia A. Earle and Al Giddings, went down to have a look at the Fujikawa Maru—deck now lying in about 70 feet of water, the keel in 130. Over the course of 31 years the entire ship has been transformed from "a bare metal monument of human tragedy into a richly productive reef of extraordinary beauty." Hatchways are filled with hundreds of small silver fish and curtains of algae cover exposed port-holes. A veritable jungle of marine growth covered every surface exposed to light.

Not all the large corals and giant mollusks in the sunken hulls of these ships could be 31 years old, but they positively could not be older than that. A species of *Stylophora* grew like a chrysanthemum on the bow gun. More than five feet across, it had increased in

diameter at an average rate of two inches per year. An exceptionally large black coral tree of the genus *Antipathes* grew in 60 feet of water on the starboard side of the ship. It was 15 feet high! Most specimens of this commercially valuable coral are only three or four feet high, no doubt because they grow in deeper water where less food is available.

Usually coral reefs are considered as being exceedingly slow-growing. Thus according to Jerome Wyckoff (*Rock, Time, and Land Forms*, p. 342):

If food supply and temperatures are favorable, and reef-building animals are not harmed by strong influxes of water or mud (as might pour off an island after extraordinary heavy rain), a reef can grow upward at the rate of ten to twenty fathoms per thousand years.

At six feet per fathom this is equal to 720 inches or a rate of .7 inches per year. Thus in 31 years one would expect a size of about 21 to 42 inches instead of the 15 feet of growth made by the black coral tree.

The remarkable growth made in only 31 years by the coral on these sunken Japanese ships indicates how much their growth rate depends on the availability of light, food supply, and space. No doubt in the first few hundred years following the world wide Flood an abundance of space and food supply at depths giving enough light was available. The limiting factor of course would be water temperature which must be no lower than 68° F, and accordingly the great barrier reefs and atolls were only formed in warmer tropical areas.

Continued studies are planned by Earle and Giddings using these ships as laboratories. Areas have been scraped free of any organisms and the researchers now

hope to be able to study just how coral reefs are formed, and especially how rapidly they grow, since as they correctly point out, not all of the corals are even 31 years old.

— Contributed by Walter E. Lammerts

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BOOK REVIEWS

The Western Hemisphere Before 1492. A Historical Outline by Stuart S. Seaman. Nordljós Publishers, Box 172, Portland, Ontario, Canada. 66 pages. Paperback, \$3.50.

Reviewed by Donovan A. Courville*

The thesis maintained in this work, on the basis of much evidence, is that there have been contacts between the Eastern and Western Hemispheres from very early times, and certainly much before 1492.

The book is mentioned here in the *Quarterly* especially because it contains statements which may have a bearing on the Genesis account of the Dispersion from Babel. This account has raised problems to the fundamentalist scholar relative to where this incident should be placed in the sequence of archaeological levels.

An archaeological sequence can be traced back in time to the earliest evidences of intelligent man. Yet at no point in this sequence is there any evidence which can be related to a flood of the proportions described in

Genesis. Consistency would demand of the conservative Bible scholar that he recognize all of these evidences of cultural man as post-diluvian. Since the incident of the Dispersion belongs to the era of cultural man, it belongs to the era covered by archaeological investigations.

Even Bible scholars have presumed that man came to the Americas at a time notably later than the Dispersion and that he came here from the west across what may then have been a land bridge between Asia and Alaska. This view seems to have been confirmed by the discovery of remains of very early man along the route of the oil pipe line across Alaska now under construction. However, Seaman notes traditions among certain American Indian tribes both North and South, which suggest that this Dispersion extended into these areas and that the migrations came from the east. Citing De Roo, he writes:

The Toltecs claim to have come to America at the time of the confusion of tongues, arriving at Hue Pue Tlalapallan after a long, hard journey . . . The Yucatan have a tradition that they came originally from the far east, passing through the sea, which God made dry for them . . . The Olmec tra-

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ditions relate that they came by sea from the East. The Algonquins preserve a tradition of a foreign origin and a sea voyage . . .

Even some of these traditions might be taken to refer to a migration in a much later time were it not for other traditions which seem to place it at the time of the biblical Dispersion. Such an interpretation would seem to have a confirmation in the long-recognized fact that there are also extant traditions among widely scattered peoples of a universal flood. These traditions range from China on the east to the Americas on the west. The details in some cases have a remarkable similarity to the details of the biblical account. Both routes then may have been involved in man reaching what is now America at a time not far removed from the Flood itself.

Could it be that the true significance of these traditions has become obscured by the acceptance among even conservative Bible students and scholars of the opinion that the Flood and the subsequent Dispersion must be dated many thousands of years prior to the opening of the dynastic period?

In Volume I of the reviewer's work on the Exodus Problem,[†] the point has been made that archaeology *does reveal* the evidence of a major dispersion of peoples out of Mesopotamia into the surrounding areas. This occurred at a time when the *Jemdet Nasr* culture was in vogue in Mesopotamia. These migrations have been traced by the appearance of this same culture into these widespread areas. *But the evidence belongs just prior to the opening of the dynastic period, not thousands of years earlier.* Against the background of commonly accepted beliefs, it was not possible to recognize this migration as that of the Genesis account.

Actually, there was no such long period between the Flood and the dynastic period. The evidences now interpreted to demand such an extended time period are susceptible to a most rational and alternate explanation within the limits imposed by even the most demanding interpretations of Scriptural data. When the Dispersion is thus placed, these traditions are not at all improbable and may be taken to represent recollections of events so outstanding as to be part of such long-retained traditions.

☆ ☆ ☆

Geological Hazards by B. A. Bolt, W. L. Horn, G. A. Macdonald, and R. F. Scott 1975. Springer-Verlag, New York. 328 + viii pages, \$25.80.

Reviewed by H. L. Armstrong*

Most creationists are, to some extent, catastrophists. They believe that the Flood occurred; and even possibly other catastrophes, though not world-wide but still very destructive. So an account of the nature of such disasters can be useful to anyone trying, after the event, to sort out what might have happened and how.

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[†]*The Exodus Problem and Its Ramifications*. This two-volume set is available through Crest Challenge Books, P. O. Box 993, Loma Linda, CA. 92354, mailed post paid at \$9.95 per set.

Topics include: earthquakes, tsunamis, volcanoes, avalanches, landslides, and floods. Considerable theoretical information is given where that is appropriate; for instance, in connection with landslides there is an account of many of the principles of soil mechanics. And actual instances of the various kinds of disaster are cited at some length. Thus the book makes available much information, both about theoretical considerations and about what has actually occurred.

One example of possible use might be mentioned. Alleged overthrusts, in which a block of rock is supposed to have slid over other rock, have been discussed in the *Quarterly*. Now landslides are cases in which undoubtedly some material has slid over other material. So it might be supposed that the end result of an overthrust would be something like the remains of a landslide. But many of the large alleged overthrusts would seem to have no resemblance to landslides at all.

☆ ☆ ☆

Aristotle's Man by Stephen R. L. Clark. The Clarendon Press, Oxford, 1975. xiv + 240 pages. Price \$19.25.

Reviewed by H. L. Armstrong*

The title of this work refers to Aristotle's view of man, and of what is good for him. But since Aristotle was never one to keep topics in water-tight compartments, many things, even astronomy and physics, are included. Also, there are some interesting comparisons of Aristotle's views with Eastern philosophies.

For creationists, the chief interest in this work will be in the arguments which the author suggests against mechanistic views of the world, and also against Darwinism. There are many arguments in favor of the importance of final causes, and of considering things in terms of purpose. The author proposes the interesting thought that, in Aristotle's view, it is not true that men are beasts which have ascended. Rather, the beasts are men which have descended—"degenerate men" as the author says.

It is not entirely clear whether this last view is proposed as historically true, or just logically true. A creationist can agree to a certain extent. Since men are made in the image of God, the beast may have something of that image, but more attenuated, so to speak; in that sense the beasts are degenerate men, logically but not historically. But this does not mean that there is anything wrong with the beast, just that they have a lower position in the order of things.

An interesting incidental point is the attribution of some notions to Empedocles, which commonly have been ascribed to Darwin. Of course Empedocles preceded Aristotle by a century or so. Even the term "Empedocleanism" is used.

FILM REVIEW

"Gregor Mendel—Father of Modern Genetics." A German Documentary Film. Obtainable on loan from the nearest Embassy of the Federal Republic of Germany. Time 15 minutes. Commentary in English.

Reviewed by H. L. Armstrong*

This film gives a straightforward account of Mendel's experiments, and shows some reproductions of those experiments. The discussion is simple enough to be clear

to students in any class on Biology or Natural Science.

Creationists can find Mendel's experimental results helpful, for the facts of heredity, which he discovered, are in many ways antithetical to the unwarranted assumptions of Darwinism. Of course, the film producers did not set out to emphasize Creation. But the word "evolution" is never mentioned.

In general, then, this film is suitable to be shown to introductory classes in any school, Christian or secular.

LETTERS TO THE EDITOR

A Thousand Years and a Day

Recently in the *Quarterly* there have been several references to "A Thousand Years or a Day", as in 2 Peter 3:8. My grandfather, Rev. F. Kuegele, who was a Lutheran pastor in the late 1800's and early 1900's used to give an illustration in sermons.

His application referred to comparing our limited capability of vision, as humans, with God's seeing all things, from eternity to eternity. I might now illustrate the notion in more modern terms.

Consider an astronaut, high above the Earth. He might be able to see the whole breadth of the nation at once, although a man on the ground could see for only a mile or so. So to the astronaut, 3,000 miles is as one mile. Just so, God can comprehend a thousand years—or, for that matter, eternity—as easily as man comprehends a day.

But the astronaut loses something for his breadth of view. He loses detail. He cannot, for instance, make out individual buildings, although he can perhaps distinguish cities.

But God is not thus limited, either in space or in time. He can give something, in a day, or in an instant for that matter, the close consideration which would take man a thousand years—if he could do it at all.

Thus, in this sense, for God a day is as a thousand years. How a thousand years are as a day for Him had been explained previously.

Cordially,
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☆ ☆ ☆

The Golden Bough Tarnished?

You have asked me to enlarge on my observation that Frazer's, *The Golden Bough*, is the result of theorising, and is based hardly at all on actual observation. As an anthropologist of Oxford and London Universities, the information which I have on the matter is as follows:

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Earlier social anthropologists were prone to give inadequate theories to explain the origin of man's universal sense of religion. Victorian writers such as Frazer who wrote *The Golden Bough*, and Tylor, followed by Durkheim, Levy, Brunhl, and others, all thought up individual explanations. According to one theory that sense evolved from magic and religion to science. Another theory was that it came via shadows, spirits, then gods; or according to another dreams, spirits, then polytheism, and finally monotheism.

These were all subjective theories, thought-conditioned by the mode of life enjoyed by the upper class of Victorian England. This fashion of reasoning depended more upon whether an argument sounded convincing to Western ears than on the searching out of facts; and it was called dialectical analysis. Such a method was bound to pass away with the advent of empirical inductive analysis based upon field research among the people who were being speculated about.

Since more attention has been paid to facts there has been a great advance in ethnological knowledge.

For instance, Professor Evans-Pritchard and others declared that the Victorians mentioned never had field experience of primitive peoples, or at most, superficial experience.¹ Baker had said of the Nuer that they were without belief in a Supreme Being. Evans-Pritchard, having gone to live among them, found that this was not true. Likewise Dr. A. Butt found a belief in a Supreme Being in British Guiana.

Such findings agree with those of such investigators as Schmidt, Lang, and Zwemer, who found that original beliefs all over the world were in a Supreme Being, often called the Sky God or High God. They thought that this indicates that God had revealed Himself to earlier peoples; and that these peoples, in turn, handed the revelation down to the primitive people of the present times. Polytheism, then, came later, as a corruption of the original purer revelation.

Again, the early anthropologists such as Morgan, McLennan, Tylor, and Frazer, took it for granted that early man had no marriage laws or sanctions. Rather, they assumed him to have been promiscuous. This view they based on their own philosophical outlook, not upon any known facts. Frazer, in particular, used to write book after book full of such notions, plausible but unfounded. One still sees *The Golden Bough* displayed

prominently in older and uncritical libraries. In no other period of history, perhaps, was so much philosophical nonsense churned out and devoured by a gullible public.²

Engels was a similar writer. Professor Radcliffe-Brown, of Oxford, writing on "Kinship and Marriage" in 1950, dismissed such earlier false assumptions, saying: "one of the most famous pseudo-historic speculations of the last century was the idea that the earliest form of society was one based on 'matriarchy' or 'mother-right'."³

In contrast, Jacobs and Stern, in the light of more recent investigations, writes: "Thus, the monogamous family, and not promiscuity, was in all likelihood the earliest form of the family, and it has remained the dominant form in all societies."⁴

References

¹Evans-Pritchard, Prof. E. E. 1965. Theories of primitive religion. Oxford University Press.

²Pearce, E. K. Victor 1970. Who was Adam? Paternoster.

³Radcliffe-Brown, Prof. A. R. 1961. Structure and function in primitive society. Cohen and West.

⁴Jacobs, Melville, and Bernhard J. Stern 1967. General anthropology. Barnes and Noble.

Yours truly,
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☆ ☆ ☆

British Conference on "Creation and Origins"

Readers of the *Quarterly* may be interested in a conference, on creation and origins, held at the Hayes Conference Center, Derbyshire, England, 20-23 April, 1976. The purpose of the conference was to discuss a wide range of topics relating to the Biblical teaching on origins.

Three speakers took subjects dealing with the principles of Christian thinking about science and origins. The first and second chapters of Genesis were expoun-

ded to show that revealed truth is the key to our understanding of origins. The talk, "Good and Bad Science", continued this theme to show how the Bible both guides and limits a scientist. In the third study, the relationship between scientific endeavor and the Christian was illustrated by a Biblical survey of the outworking of the creation ordinances in many men of God, and supremely in Jesus Christ.

Technical aspects of the Creation/Evolution debate were considered in lectures on "Creation and Botany", "Creation and Zoology", "Thermodynamics and Evolution", and "Radiocarbon Dating and History". The weaknesses of evolutionary theory were contrasted with the strength of the creationist analysis of the evidence.

Two talks were concerned with evolutionary philosophy and the study of man himself. Since the Biblical teaching on the nature of man is of vital importance, it is not surprising that evolutionary thinking has led to attacks on many basic truths about man's place in the world and before God. The talk, "Darwinism and Society", was a sociologist's view of the impact on society made by Darwinistic ideas of struggle and the survival of the fittest, noting many unpleasant and harmful effects.

This conference was the second to be held, and there are plans to make it an annual event. The 1975 conference was organized by Mr. David C. C. Watson, and that in 1976 by Dr. David Watts, both of whom are members of the Creation Research Society. Papers of either conference can be obtained from Dr. Watts at a cost of \$2.00 per set. Any correspondence about future conferences should be addressed to Dr. David Watts, 19 Bradley Close, Timperley, Altrincham, Cheshire, WA15 6SH, England.

Yours sincerely,
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On Creation Science and Breadth of Scientific Vision

There was a time when it was expected that a scientist (or natural philosopher) would have a breadth of vision, in that he would have some knowledge of the various branches, not just of a narrow specialty. Such, in fact, was the common opinion up to the time of the Renaissance, and for some time thereafter. Nowadays it is commonly said that one must concentrate on a narrower and narrower field, like those in the joke who go on knowing more and more about less and less until they know everything about nothing.

I want to suggest: first, that the true scientific spirit still calls for some breadth of vision and of interest; second, that such an ideal is not an impossible one; and finally that Creation Science can have a very whole-

some effect on science generally by encouraging a breadth of view. In connection with the last point I suggest also that excessive narrowness of view can be a powerful influence to foster such false doctrines as evolution.

Surely few will disagree that the true scientific spirit is to seek to know the reasons and causes of things. A very prestigious British scientific society has a motto to that effect. In other words, the aim of science is understanding. There is nothing wrong, of course, with acting in accordance with understanding and knowledge. But the action is not strictly science; it is technology, engineering, or something of the sort. All of those can be worthy activities; I have no intention of saying any-

thing against them. But it is necessary to distinguish things if we are to understand them better; and there is a distinction between science and technology.

Aristotle and his followers, and later the Schoolmen, distinguished three kinds of study: theoretical, practical, and productive. The aim of the theoretical studies was understanding. (*"Theoros"* means a spectator.) The practical studies were directed toward action, as distinguished from production. (*"Prattein"* means "act", or "do".) Thus Aristotle counted ethics as a practical study. (Perhaps it is to the shame of our present times that, whereas Aristotle considered ethics a practical study and physics theoretical, we might be likely to reverse the designations.)

It is generally admitted that one cannot understand things, in this world in which there is so much to study, without some knowledge of the connections between things. And to know something about the connections between things, it is necessary to know something about the things which are connected. John Donne said: "... no man is an island . . ."; and it is equally true to say that no thing is an island. It is apparent, then, that to have a true understanding of anything requires a wide breadth of knowledge of many things.

Aristotle used to contrast the master craftsman—the *architecton*—with the subordinate workers. For the former knows the reasons: why the various materials are chosen, and the various operations performed. But the others know only how to do their own separate part; they do not see the operation as a whole. Is it not similar in science? One may concentrate on a very small sphere, without knowing or caring much what goes on outside it. Indeed, it may be quite possible thus to win fame and fortune. But the true scientist seeks to know the reasons, to know the connections between the parts. And in order to do that, he has to know something about the parts.

There are those who say that nowadays such an ideal is an impossible one. I suggest, however, that the difficulty is exaggerated, and that mainly in two ways. Science is confused with technology, ignoring the distinctions which have just been made. Moreover, of course it is possible to concentrate on one thing, of any kind whatever, to the exclusion of all else; and it may be that such a policy is the one which will pay best, in im-

mediately tangible returns. But such narrowness is not the way of true science.

It remains to be considered what all of this has to do with Creation Science. There are two points to be considered. I suggest that, in some cases, it is narrowness of vision which makes it possible to hold such a false theory as that of evolution. For there are two studies involved in most discussions of evolution: biology, and geology or palaeontology.

It can happen, all too easily, that the biologist will take the alleged geological facts, such as the alleged fossil record, uncritically from the geologist, without asking how much is really fact and how much is theory, interpretation, or dogma, and not necessarily established. Or, the geologist may not see the many objections to the alleged lines of descent, just to mention one instance, proposed in biology. Comparing the different parts of a body of (alleged) knowledge is a good way of exposing errors; conversely, keeping it in compartments serves to permit errors to continue undetected.

The creation scientist, at the present time at least, finds himself unable to work in small compartments. Partly, it is because their numbers are still small that creation scientists have to deal with a number of fields to which their work is related. Partly, they would expect to have to deal with a wide variety of matters. For things in the world are connected, because they have one Creator and Coordinator. The world is an arrangement, a cosmos; it is not "... a series of episodes, like a bad tragedy . . .", as Aristotle said somewhere.

Who would expect to understand say the transmission of an automobile without knowing something about the other parts—and also about the use of the vehicle as a whole? How much less could one expect to understand a small part of the world without having at least some knowledge of some of the other parts?

It may be, then, that those who are hopeful for the future of science should welcome the Creation Science movement as one of the best developments which could have arisen, whether or not it is to their own taste. For the very nature of Creation Science, that a unified view of things must be taken, could act to counteract the tendency to put everything into smaller and smaller compartments—a tendency which few would deny often is carried to excessive lengths nowadays.

— Contributed by H. L. Armstrong

CREATION RESEARCH SOCIETY

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

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

Membership Voting membership is limited to scientists having at least an earned graduate degree in a natural or applied science. Dues are \$10.00 (Foreign, \$11.00 U. S.) per year and may be sent to Wilbert H. Rusch, Sr., Membership Secretary, 2717 Cranbrook Road, Ann Arbor, Michigan 48104. Sustaining membership for those who do not meet the criteria for voting membership, and yet who subscribe to the statement of belief, is available at \$10.00 (Foreign, 11.00 U. S.) per year and includes subscription to the Annual Issue and Quarterlies. All others interested in receiving copies of these publications may do so at the rate of the subscription price for all issues for one year: \$13.00 (Foreign, \$14.00 U. S.).

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

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

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

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

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

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

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