

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

CREATION RESEARCH SOCIETY QUARTERLY

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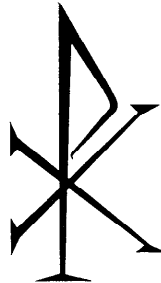


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COVER ILLUSTRATION

Pictured on the cover is a Brown Egg-Eater snake common
to South Africa, which has just swallowed a good-sized egg.
As this snake is specially adapted for eating eggs, creationists
ask, how did this Brown Egg-Eater snake gain the ability to
swallow eggs—crush the eggs—retain the contents—and, then,
regurgitate the shells? Creationists maintain that the behavior
of this snake could not be the result of chance events, but
another example of created design provided by the Creator. A
short essay and further illustration of this unusual behavior
may be found elsewhere in this issue.

NEW EDITOR'S NOTE

The theme for the Annual Issue of the *Creation
Research Society Quarterly* in June 1974 will be
competing philosophies of origins; the philo-
sophical aspects of creation. Papers are invited
that center on analyses of competing ideas of
origins; such as, analysis of expanding universe,
steady-state, apparent age creation, and sub-
microscopic spontaneous generation of life con-
cepts. My duties as Editor will begin with that
issue, as announced in the Annual Report of the
Board of Directors available in the current issue.
Papers intended for the 1974 Annual Issue should
be sent early in 1974 to Prof. Harold Armstrong,
4 Couper Street, Kingston, Ontario, Canada.

Readers should expect that the *Quarterly* will
continue along the lines so well established in

past years. May I offer to prospective authors a
suggestion, arising not from my views but from
the way in which things have developed? I sug-
gest that now we need not devote as much space
to apologies—to arguments in support of Creation
—as we have needed to do in the past. Rather,
we may often take it as known that Creation
(and the Flood occurred, and go on to develop
consequences, and to re-interpret observations in
terms of those events. Of course, we have always
published articles of that sort; what I am suggest-
ing is that the time may have come for more and
more emphasis on that aspect of our work.

—Prof. Harold Armstrong,
Editor-elect

TRACE ELEMENTS IN THE CREATION

C. E. A. TURNER*

Formerly many of the chemical elements were regarded as being without biological significance. However, an increasing number of both metals and non-metals in minute quantities (trace elements) in the soil and diets, have been shown to have profound effects on plant and animal life. These chemical and physiological studies show the remarkable and complicated interlocking of the functions of many elements. Such can hardly be attributed to chance or evolution, but rather to the direction of the infinitely wise and almighty Creator, who has purpose in all the materials of his Creation.

Introduction

There has been a great increase in the amount of physical and chemical research, and extensive development of finer analytical techniques in the last half century. Much knowledge has been gained about the importance of very small concentrations of certain chemical elements; many of which were once regarded as scientific curiosities, and would have included perhaps the majority of the 92 elements usually listed.

The metallurgist has found the addition of small quantities of aluminum, copper, manganese, molybdenum, nickel, vanadium and wolfram to iron, as well as the earlier discoveries about carbon, cobalt and chromium, had profound effects in producing improved steels for various purposes. The same is true of numerous other alloys.

The effects of small quantities of certain elements on living creatures has long been known. Several of these, such as arsenic, antimony and lead, have chiefly proved poisonous. Wishful thinking through the ages of the medical value of gold, in spite of injections for arthritis, has been largely unfulfilled.

The main elements regarded as essential to plant and animal life are comparatively few. They are calcium, carbon, chlorine, oxygen, hydrogen, magnesium, nitrogen, phosphorus, potassium and sulphur, with the addition of sodium for mammals and man.

To this list must be added an increasing number of "trace elements," and these in very small quantities. The obvious first was iron, and later, probably for animals and man only, iodine.

So that those now regarded as required by both animals and plants, are copper, iron, manganese, molybdenum and zinc. To the list for animals, iodine and cobalt must now be added, and to that of most plants, boron and silicon. Probably more will follow for each group.

The quantities of the elements present in organisms, of course, vary. In man the total of these trace elements amounts to under 0.005%, and if iron is excluded the figure is under a fifth of that amount.

The Element Iron

The element which, more than any other, has given man increasing control over his environment in this Iron Age, proves even more important in creation as essential for his very life. It is interesting to note that the ancient Romans realized the value of using solutions of iron salts for the treatment of anemia. However, to J. von Liebig went the honor of the great discovery of iron combining in the blood with oxygen.

The amount of iron in an adult human of 70 Kg is 3 to 4 gm or about 0.004% of the body weight. And 65% of this is in the blood, nearly all in hemoglobin. Here it is locked in a complex compound of which it comprises 0.335%. The structure of hemoglobin is one of the marvels of creation, and its function, through the reaction of the iron atoms in it with oxygen, is vital in respiration.

Hemoglobin consists of four units, each composed of a molecule of heme united to the protein globin. Perutz and his colleagues, using X-ray crystallography, found it consists of four polypeptide chains each containing a heme molecule. These chains interlock and form an ellipsoid of molecular weight 67,000. The heme molecule contains a single atom of iron combined with 74 other atoms; itself the center of four pyrrole rings, themselves arranged in a ring known as the porphyrin ring.

Iron is also found in human blood plasma in a number of other complex compounds, such as transferrin (siderophilin) which is a protein, one gram of which is able to take up 1.25 mg of ferric iron to convey to various tissues. Iron leaving the plasma is stored in bone marrow, the liver and the spleen. Storage compounds include ferritin, which consists of a protein of molecular weight 460,000 combined with 20% of its weight of iron. Another of these is the insoluble hemosiderin.

A number of other iron-containing compounds are apparently needed in the composition of various other creatures. One of these is an iron proteinate, hemoerythrin, which functions like hemoglobin, but is unlike it in structure. It is pale when reduced but red-brown when oxygenated, and is found in marine worms such as *Phaseolosoma* and the brachiopod *Lingula*. Chlo-

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rocurorin consists of a protein combined with a porphyrin containing iron. It is red in concentrated and green in dilute solutions, and is found in certain polychaete worms.

Enzymes are complex compounds formed only by living cells, and catalyse specific chemical reactions. Some 15 of them contain iron. One group of these compounds are oxidases, which are important for respiration and the oxidation of organic compounds in the blood. Catalase is one of the most powerful known, and consists of four iron atoms incorporated in a compound of molecular weight 248,000, obtained in a crystalline state from the liver. It can decompose 2,640,000 molecules of hydrogen peroxide per minute at 0° C.

Lactic or lactate dehydrogenase, used to oxidize lactic acid, has also been crystallized and found to contain iron. Pyrocatechase with a molecular weight of 82,000, includes two atoms of iron in its structure. Succinic dehydrogenase of molecular weight 200,000 has been separated with its four iron atoms. And there are other enzymes which contain iron, such as DPNH cytochrome C reductase, which contains several iron atoms in its molecule of weight 78,000.

Iron has also been found to be an essential component of the catalyst involved in the production of chlorophyll in plants.

The Element Copper

Copper was long thought to be nothing but toxic to organisms. The element amounts to but 0.0004% of the weight of the human body, or $\frac{1}{10}$ that of the iron present. Nevertheless copper is essential. The fetus, especially in its liver, is rich with a store of trace elements, particularly copper. Concentration of the element in late pregnancy is three times that of normal human blood which contains about 0.09 mg per 100 ml.

Anemia due to copper deficiency is morphologically indistinguishable from iron-deficiency anemia. The value of copper in the regeneration of the blood of children and animals has been demonstrated.

Lack of copper in the diet leads to bone deformity due to reduced calcium assimilation. Low levels of copper in food have resulted in poor growth, retarded milk production and impaired fertility in cattle. Degeneration of the nervous system, causing such diseases as "Sway Back" in sheep, and heart failure as "Falling Disease" in some Australian cattle, were traced to copper deficiency. This discovery led to six million acres of pasture being reclaimed by the application of copper.

Wool is largely composed of molecules of the protein keratin. Deficiency of copper in the food of sheep causes wool to lack crimp and to be steely or brittle. This is due to the absence of

an enzyme containing copper, which controls the linking of these molecules.

Among plants, marked increases in growth occurred when copper was used with nitrogenous fertilizers. Application of copper to peat soils greatly improved their fertility. This also gave a higher copper content to the plants, with the consequent benefit to the cattle. Spectacular responses to copper by rice crops in Bombay State have also been reported.

Compounds important to some organisms include hemocyanin. It is a blue respiratory pigment found in the blood of crabs, squids and octopuses, which has copper in its prosthetic group. In some crustaceans it has a molecular weight of 360,000; in *Limulus* (horseshoe crab) it is 1,300,000; in the octopus, 2,000,000; and in *Helix* (land snail) 5,000,000. It is not a porphyrin like hemoglobin, but a copper proteinate.

Hemocuprin, a protein containing 0.34% copper has been isolated from human red blood cells and from plasma. Another protein, hepatocuprein, containing the same amount of copper, is found in liver. Some brain proteins contain copper, and these include cerebrocuprein I which has a molecular weight of about 35,000 with two atoms of copper.

Thus the element has been given important functions by God in His Creation. Furthermore a number of vital enzymes have been found to contain copper. Among these are A2-globulin (caeruloplasmin), monamine oxidase and δ -amino-laevulic acid dehydrase. Ascorbic acid (vitamin C) oxidase has been shown to contain six atoms of the element in its molecular weight of 146,000 or 0.26% copper. Tyrosinase contains 0.3% copper and laccase 0.34%.

Polyphenol oxidase contains 0.2-0.3% of the element as four atoms in the molecular weight of 100,000; while uricase has a single atom of copper in its molecule of the same size. Yeast, which contains a number of enzymes, shows 0.004% of its dry weight is copper.

The Element Zinc

Zinc is only 0.0001% of the body. Human blood contains about 0.75 mg per 100 ml and nearly all of this zinc is found in the red cells combined in the enzyme carbonic anhydrase. This compound has a molecular weight of 30,000 with one zinc atom. Its very important function, vital to respiration, is to catalyse the splitting of carbonic acid into water and carbon dioxide.

Zinc is also present in alcohol dehydrogenase, which contains four or five atoms of zinc in its molecule of weight 150,000. And it is found in the enzymes: alkaline phosphatase, carboxypeptidase, lactic dehydrogenase and liver glutamic dehydrogenase.

The zinc content of viable human sperm is very high. It is necessary for the proper functioning and development of the male reproductive organs. Thus the element is another Divinely appointed essential to the survival of life.

Deficiency in the element particularly affects fruit, legume, cereal and grass crops. Sugar cane yields in Natal, South Africa, were greatly increased by the application of zinc salts to deficient soil.

The hormone insulin is well known as necessary for carbohydrate metabolism. It is a protein having a relationship with zinc. While active material can be obtained free of the metal, it is present in the crystalline form used, which has a molecular weight of 6,000. The pancreas, in which it is formed, is rich in zinc. In treating diabetes, protamine zinc insulin added to insulin produces the advantage of prolonging the effect of the injections.

The Element Manganese

Manganese is another element thought unlikely to have a beneficial function in the life process. It is only about 8 millionths of the dry matter of many plants, and 0.00016% of the human body. Yet it is found in many enzymes, or as an active part of the prosthetic groups. These include arginase, pancreas-nuclease, phosphoglucokinase, hydroxylamine reductase and uricase.

In chickens, pigs, dogs and rabbits it is reported that a deficiency of manganese has resulted in malformed bones. An excess or a deficiency in the case of cows caused a 20% reduction in gestation. Egg production was also decreased by a deficiency. It is thus important for growth, bone formation and fertility, while it also assists hemoglobin regeneration.

Plants in many cases show remarkable benefit from the presence of traces of manganese. It is involved in the activation of enzymes concerned with the formation of chlorophyll, and all chlorophyll tissues contain the greatest concentration of manganese. Over 50% increase in the carotene (the precursor of vitamin A) content of soya bean leaves occurred where the manganese deficiency was made good.

"Gray Speck" is a disease occurring in oats where the element is deficient. The addition of manganese to apparently healthy potatoes doubled the crops. In South Africa the production of certain apple and pear orchards was increased by 450% by the application of manganese. Similarly a 100% increase in wheat yield is reported after spraying with manganese sulphate solution.

Application of manganese in correct quantities produced an increase of 18% in the yield of tomatoes, and a 28% increase in their vitamin C content. It also diminished by 15% the un-

desirable protein zein in maize and increased the other proteins.

It has been found that molluscs from very different parts of the world are rich in the element. The freshwater bivalve *Anodonta cygnea* in particular has a large amount, chiefly in the liver and gills. The element is in the form of a metallo-organic complex (Mn + protein) which earlier investigators thought had a respiratory function, but this is not so, although its use is still to be discovered.

The Element Cobalt

Cobalt long seemed to have no relevance to life. Yet the discovery of its function in the Creation led to curing "Phalaris Staggers" in sheep and cattle in vast areas of land in Australia, Russia and elsewhere.

Cobalt is important as being the essential and single metallic atom of the 183 in the cobalmin or vitamin B12 molecule, and amounting to 4% of the weight. The quantity in the normal body is exceedingly small, being about 80 μg altogether. Intake of this remarkable compound need be only 1 μg a day, but without vitamin B12 nervous disorders and anemia occur.

Cobalt is synthesized by micro-organisms in the gastrointestinal tract of ruminants, from the element supplied in the diet. It is the anti-pernicious anemia factor in liver extract used clinically, and was isolated in 1948 as a red crystalline compound by E. L. Rickes and his co-workers. Administration of small amounts of cobalt salts stimulates erythropoietin production.

Cobalt is also required by the bacterium *Rhizobium*, which fixes nitrogen in the roots of leguminous plants. The use of cobalt salts thus produced a 60% increase in a soya bean yield.

The Element Molybdenum

Molybdenum, one of the heavier elements, is required by living tissue in only minute quantities, and is less than 0.00001% of man. It is important in the development of healthy teeth.

In molybdenum-deficient soil, "Whip Tail," a growth abnormality in cauliflower, develops. This is curable by applying a pound of sodium molybdate per acre. Where deficiency of the element was removed, the vitamin C content of vegetation doubled.

For animals and man molybdenum is extremely important as a constituent of the enzyme xanthine oxidase, which contains 0.03% of the metal. Xanthine oxidase is particularly plentiful in the liver and intestines. It catalyses the final reaction in the formation of uric acid, a waste product of protein metabolism, before its excretion by the kidneys.

Molybdenum is also important for fixation of nitrogen in plant nutrition, as part of the mole-

cule of the enzyme nitrogen reductase. This catalyses the reduction of nitrates from the soil to nitrites, as a first step in the building up of proteins. So another element, long regarded as of biological insignificance, has been given vital functions in the Creation.

Elements Nickel, Cadmium and Silver

Nickel is not normally of biological interest except as causing toxicity. There is some evidence, however, that the element could replace cobalt in the treatment of certain cattle diseases. Remarkably Laevastu and Thompson in 1958, found in their sea water investigations that plankton contain twice as much nickel as the higher marine plants, and ten times the amount found in fish and molluscs they examined. It is not yet known if this element is essential to their life, or if it exists in them as organic compounds, or if the creatures are, for some reason, accumulators of nickel. Certainly its presence in such quantities in this essential food for so many kinds of fish is noteworthy, and thus constitutes another wonder of the Creation.

Cadmium is generally also regarded as a toxic element, and small amounts have been found damaging to the testes. However, it has a value in that it is found in the prosthetic groups of the enzymes prolinase I, arginase and urease.

Silver is found in minute quantities in the thyroid gland and tonsils, but its function there is unknown at present. The element is used in medicine in colloidal form in association with the proteins, and silver ions have a valuable germicidal effect.

The Element Vanadium

Vanadium is one of the less common elements, but has been known since 1830. It was certainly not usually regarded as of biological significance, but it has been found to be an essential constituent of sea squirts. Vanadium chromogen is a pale green pigment in the blood cells (vanadocytes) of these creatures, the Ascidiidae and Perophoridae, and appears to have a respiratory function. The evolutionist has an insurmountable problem here to explain the presence of vanadium rather than iron in the blood, for effecting this action.

Vanadium is also found in some fungi. In the alga *Scendesmus obligatus* it is beneficial if not an essential nutrient. It also promotes growth and nitrogen fixation in the microbe *Azobacter*, acting as a catalyst.

In mammals vanadium has beneficial effects on teeth and in hemopoiesis. It also reduces cholesterol levels and inhibits some cancers.

Incidentally vanadium is found in coals and petroleum as well as in its ores. These deposits may well have developed from plant and animal

tissue. In Italy, soot has proved a valuable commercial source of the element.

Elements Lithium, Sodium, Magnesium

Lithium, the alkali metal allied to sodium, and the lightest of all metals, is not yet known to be essential in the biosphere. In fact it has been found to be somewhat toxic in California citrus groves. The plant families Ranunculaceae and Solanaceae act as accumulators of it. However, the lithium ion can replace sodium in nerve tissue. It has also recently been found that lithium chloride changes the state of brain activity, reducing aggressive behavior in treating manic-depressive psychosis.

Sodium, like chlorine with which it is usually combined as sodium chloride or common salt, is essential to animal life, and is ninth in abundance in the human body at 0.15%. Plants, however need it as a trace element, especially the algae *Anabaena cylindrica* and the desert shrub *Atriplex vesicaria*. It can help replace potassium in many cases, and root crops such as beet especially benefit from it, as do celery and asparagus.

Magnesium is not really regarded as a trace element either in animals or plants. It represents about 0.6% of the dry material in a typical plant and about 0.05% of the human body, or some twelve times the amount of iron present. In the latter it is half in bones and half in cells, where it is an essential part of many enzymes including phosphoglucomatose.

However, as an example of the wonderful planning of the Creator, who gave magnesium a vital role in the life cycle, it should be mentioned here in one particular respect. That is as the single metallic atom among the 137 forming the molecule of chlorophyll which has a similar chemical structure with its pyrrole rings to that of heme in blood, but at 892, a much smaller molecular weight. The compound is the green material in plants essential to photosynthesis and thus their growth, and ultimately, to maintain life in man and beast. Thus in another sense "all flesh is grass."

Elements Aluminum, Boron, and Others

Aluminum is always present in soil, and is third in order of abundance at 7% of the Earth's crust, chiefly as a constituent of silicate rocks. It is present in only minute quantities in living matter, and was not regarded as relevant to life. However, its use in water cultures showed the element's value, as it greatly increased the yield of millet and maize. There is also some evidence that it functions in catalysts in mammals.

Of the non-metallic trace elements, boron has long been known in a number of compounds. Of these only boric acid or its salts, as anti-

septics or preservatives, have had a biological significance. Its concentration in typical dry plant material is only about three parts per million, but its absence from soil can prove disastrous.

Boron deficiency has been shown to lead to "Brown Rot" in swedes* and to "Heart Rot" in economically important sugar beet, to stunting and malformation in cauliflower, and to rotting in celery, which needs more of the element than most plants. A number of other economic plants develop rusts and mildews in the absence of sufficient boron. Also many pollen grains will not germinate in its absence.

On the other hand, application of suitable concentrations of boron have markedly increased the yields of such widely differing crops as apples, coffee, lucerne and mangolds (beets). It is particularly valuable to sugar beet, increasing the yield, and proving necessary for the translocation of sugars from the leaves. This is probably effected through compounds known as boron chelates, in which the element is united to certain organic molecules. Another valuable property of the element is its beneficial influence in the production of certain vitamins of the B group, namely thiamine and niacin.

Ascarian blood, as well as containing the remarkable vanadium compound mentioned above, contains unusually large amounts of chromium, manganese, molybdenum, niobium, tantalum, titanium and tungsten. The presence of these elements is not merely due to local deposits, but is general. Their functions are probably catalytic. Niobium, like vanadium, may be used for low oxygen levels. Some creatures apparently use selenium and tellurium as electron acceptors. It has been suggested that gallium and scandium found in some plants act as catalysts in certain enzyme structures. Thus from these observations a further number of trace elements appear to have been given a function in the Creation—to the confusion of the evolutionist!

Elements Iodine, Chlorine, Fluorine

The Greeks of 2000 years ago used the ash of sponges (now known to contain iodine) in the successful treatment of goitre. Iodine is found in man to be but 0.0004% of his weight or four parts in a million and thus only a hundredth part of the iron present. Yet a deficiency leads to the disfiguring and disabling goitre found in many races. This disease called hypothyroidism is due to failure of the thyroid gland to produce the hormone thyroxine.

The thyroid gland contains 0.06% iodine which is bound to protein in the cells. The

presence of iodine in the thyroid gland was found by Baumann in 1895, soon after Murray had discovered the therapeutic effect of the thyroid extract of animals. Thyroxine was crystallized in 1919 by Kendall in the U.S.A., and synthesised in Britain by Harrington and Barger in 1927. This compound has 35 atoms, four of which are of the vital element iodine, designed by the Creator for the healthy functioning of human and mammalian life.

Of the other elements in the halogen group, the function of bromine is yet unknown. Chlorine is present in small quantities in living matter, being 0.15% of the body, and is not regarded as a trace element. It occurs in organisms in the form of common salt and other chlorides, and as an essential constituent of the gastric juice. In tropical conditions it can be insufficient in diets. As is well known its deficiency is met by salt licks for sheep and cattle.

The other halogen, fluorine, is only a minute part of the weight of man. Normal bones and teeth have 20 to 30 mg of the element per 100 gm of ash, with more in the dentine than in the enamel surface. A low level of fluorine in water is linked with tooth decay, but if the concentration is one part per million up to two parts in the water the incidence is very much lower.

Excess results in debilitating fluorosis with excessive calcification and discoloration of the teeth. This is another case of the delicate balance between excess and the amount necessary to health. Strangely tea and sea fish are the only other sources of this element in diet apart from the fluorides in drinking water.

Elements Silicon, Sulfur and Selenium

Silicon is the second most abundant element in the Earth's crust, its oxide being estimated to form 55% of it as rock and soil. It is found in varying quantities in different plants, being present in the macro quantity of about 1.2% in maize.

While apparently unnecessary to man and not essential to all plant growth, silicon is valuable in giving mechanical strength to most plants. It is present especially in the connective tissue of mammals and forms a high proportion of the ash of feathers, probably giving them rigidity.

Sulfur is an essential constituent of a number of proteins, and, at 0.25%, is in greater abundance in the human body than sodium, chlorine or magnesium.

Selenium has a number of properties similar to sulfur, but is normally regarded as valueless or toxic. The presence of selenium in grasses and other plants produces "Alkali Disease" in cattle, characterized by particularly abnormal development of the feet. Yet it appears that vitamin E and selenium are part of certain pro-

*A "swede" is a Swedish turnip, *Brassica campestris*, var. *napobrassica*, much used in Europe as a domestic vegetable and also for winter cattle feed.

tein structure. Also selenium as well as zinc, is essential for the proper functioning of the testes.

Injections of vitamin E (α -tocopherol) or selenium prevent "White Muscle Disease" in sheep. Ten mg of selenium given monthly produced a marked increase in the growth rate of some Aberdeen Angus calves. Rats were also protected from necrotic liver degeneration, and chickens from exudative diathesis by minute quantities (a few micrograms daily) of this mysterious element.

Discussion

The above observations, if studied in detail in original source papers, show that a fine balance must be obtained in trace element concentration, in order to secure plant and animal health, and even to maintain life. There is a danger of overdosage, most elements in excess of certain limits having toxic effects, manganese in particular being so to man.

Trace elements may also act against each other, and in some cases one may assist another. But it is exceptional for one to be replaced by another with benefit to the living organism.

Important differences of course exist between the requirements of plants and those of animals. Thus iron is less important to the former, but essential to mammals, and the same applies to cobalt. Plants also hardly need iodine or sodium, but mammals require both.

On the other hand, boron certainly, and silicon probably, are necessary for plants, but so far do not appear to be essential to animals. Also, of course, different plants and different animals have needs of trace elements of different kinds and in different quantities.

It should be remembered too that elements function in many different ways in both animals and plants. The health of plants and animals in a particular area has been found by biogeochemical investigators frequently to be due to the presence or absence of certain trace elements in the soil of that district.

So the condition of certain plants in particular, causes them to act as indicators (to the advantage of prospectors) of the presence of certain trace elements. Thus the infinite wisdom of the Almighty Creator is in part manifested in the marvelous interlocking functions of so many elements, in such low concentrations, in His Creation.

What of the numerous elements not mentioned above, either as macro or micro constituents of organisms? Some writers, yet without confirma-

tory observations, claim that such elements have an effect in the biosphere.

Certainly ions as well as compounds of the trace elements named can catalyze some organic reactions. They influence enzymes by producing a cationic climate of clouds of ions. It is known already that cobalt, copper, iron and manganese form chelated (claw-like) compounds with amino acids. Examples are copper diglycinate and the cobalt-cysteine complex.

It may well be that ions of the other elements have similar effects, but this has yet to be confirmed up to the time of writing this paper. Arsenic, bromine, chromium, gadolinium, germanium, tin and titanium are among those for which definite functions are yet unknown.

Conclusions

Perhaps two remarks may be added in closing this paper. One is that deficiencies and toxicities connected with the distribution and existing quantities of certain elements may be regarded as departures from the original creation, pronounced "very good" by God in Genesis 1:31. Such differences could well have been occasioned by the Fall of Man and subsequent global catastrophes such as the Flood.

The second point to be made is that of hope (expectancy) that in a new Earth under the beneficent, wise and righteous rule of the Lord (II Peter I, 13), all imbalances will be removed.

Finally as we view the importance of these trace elements in the Creator's economy, we may well concur with Evelyn Underhill in her poem, "Immanence":

"I come in the little things,"
Saith the Lord,
"Not born on morning wings
Of majesty, but I have set My Feet
Amidst the delicate and bladed wheat
That springs triumphant in the furrowed sod."

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FIELD EVIDENCE OF RAPID SEDIMENTATION

WALTER G. PETERS*

Recent research reports and original photographs are presented to substantiate catastrophic and rapid Mesozoic and Paleozoic sedimentation. Bentonite clay is directly related to volcanic eruptions. Violent crustal tectonics are related to all Paleozoic deposits. The vast difference between Paleozoic and Mesozoic sediments neatly correlates Paleozoic sediments to the duration of the higher water levels of the Noachian Flood. Geological strata reinforce faith in the veracity of the Bible.

Introduction

Authors of recent reports in geology are emphasizing restudy and reinterpretation of the mechanism and rates of sedimentary processes. Evolutionists are recognizing the failures and fallacies of classical uniformitarianism. They are admitting the necessity of blending catastrophism with neo-uniformitarianism. Recent field observations I made on camping trips together with photographs taken in the laboratory are presented to encourage more re-evaluation of geological interpretations by geologists and students.

Bentonite and Volcanism

Many visitors of the Western States have been awed by the rounded "teepees" of the Painted Desert in Arizona, and similar formations in Wyoming, and in Alberta, Canada. They marvel at the range of colors from purples, reds and yellows to greens and blues of the Mesozoic shales.

The Carlisle and Benton Shales of the Colorado Group (lower middle Cretaceous) are important sources of bentonite in northeastern Wyoming. My wife and I visited the Industrial Mineral and Chemical Corporation processing plant in June 1972, located about 20 miles west northwest of Belle Fourche, South Dakota.

These Cretaceous strata are weakly lithified. Evidence of the spongy consistency is the warped, rolling railway spur leading to the plant. A locomotive was derailed about a half mile east of the processing plant. Such derailment was a frequent occurrence according to Martin Krone, the laboratory analyst. He added that this plant has been processing gray, brown, yellow, green and blue bentonite.

Bentonite is of interest to creationists because of its origin. It is used as a Fuller's earth to plug up seepage into wells. It is rich in montmorillonite, $(Al\ Mg)_s(Si_4O_{10})_3OH_{10}12H_2O$, an expanding 2:1 layered smectite clay mineral. Deer, Howie and Zussman¹ state, "These have been formed by the alteration of eruptive igneous rocks, usually tuffs and volcanic ash . . . sodium is the naturally occurring exchange cation"; and they add:

. . . thus montmorillonite results from the weathering of basic rocks mainly in conditions of poor drainage when magnesium is



Figure 1. Puye Conglomerate; Miocene-Pliocene, about one and a half miles west southwest of Socorro, New Mexico at a roadcut of U.S. Highway 60.

not removed . . . (and is favored by) . . . an alkaline environment, availability of calcium, and paucity of potassium.²

The widespread area in which these colored shales occur, the thickness of the formations, and the catastrophic implications of eruptive volcanic ash are obvious to creationists and evolutionists alike.*

Permian Conglomerates and "Talus"

The brecciated talus structure of the Permian El Capitan limestone mountains of New Mexico

*A personal communication from Donald W. Lane, Geological Survey of Wyoming, November 27, 1972, indicates that the primary source of the bentonite in the Colony, Wyoming area is the Lower Cretaceous Mowry shale. The Geological Map of Wyoming provides the following information:

Three Upper Cretaceous shales have bentonite beds: The Monument Hill bentonite beds and the Pedro bentonite beds of the Pierre shale and the Cody shale with many bentonite beds.

There are four bentonite shales in the Lower Cretaceous beds of northeastern Wyoming:

The Belle Fourche shale, which is black, soft with bentonite concretions.

The Mowry shale, which is black, hard, siliceous and weathers to silvery gray. It has many thin bentonite beds.

The Newcastle sandstone, which is gray with beds of sandy shale and some beds of bentonite and coal.

The Cloverly formation, which is a light gray to brown sandstone with lenticular pebble-conglomerate, interbedded with variegated bentonite claystone.

Volcanic eruptions throughout the Lower and Upper Cretaceous were therefore significant catastrophic events accompanying the extinction of dinosaurs in an increasingly unfavorable environment.

*Walter G. Peters has an M.S.Ed. in Geology.

and western Texas have been well documented by Nevins.³ Red Permian conglomerates of the same region have been associated with submarine turbidity currents and deposits.⁴ Figure 1 shows a similar red, apparent Miocene-Pliocene conglomerate from about one to two miles west of Socorro, New Mexico.

Mid-continent Pennsylvanian Sediments

Pennsylvanian volcanism, mountain-forming intrusions, crustal faulting and severely disturbed and incomplete cyclothems are well established field observations. Even coal and sediment mixture was recognized by R. Feyes in 1961-1963 in explaining the distribution of illite clay. Illite is a 2:1, non-expanding clay derived from mica and feldspar minerals. Uniformitarianists recognize a "problem of illite" in the abrupt increase of illite from black shales (just above the coal) to comprise over 50% of the clay minerals of the gray shales and sandy shales above them. Feyes states:

A fraction of these illite shales may have been formed from soils (15%-50%), but in this case they do not seem to present any distinctive compositional change due to pedological action. This fact also seems to favor the action of vegetation in the hinterland also subject to seasonal climate, the *reworking and mixing of the coal measure sediments before their final deposition* in the swamp with hygrophytes having as a consequence the *spreading of illite* more or less uniformly through the succession, whether or not a soil and vegetation is preserved at *the point of final emplacement*.⁵

Creationists agree with the concept of sediment mixing, but propose *tidal rafting* as the method of accumulation of coal-forming plants and shale forming clays. Even the black carbonaceous Pennsylvanian shale was deposited under disturbed environmental conditions. This is also recognized by Zangerl and Richardson⁶:

The onset of the (ocean) transgressions produced an extremely sharp depositional change. Quite clearly this was not a gradual seeping of marine waters over the peat swamp, except along the most landward fringe, but very probably a sudden event accompanied with some degree of violence.

Then Zangerl and Richardson comment further:

... This marine flooding was not merely the result of a major storm, although a storm or seiche may have accompanied the initial transgression thrust; we must assume that a sudden settling of the basin took place, caused most likely by increased tectonic activity. . . .⁷

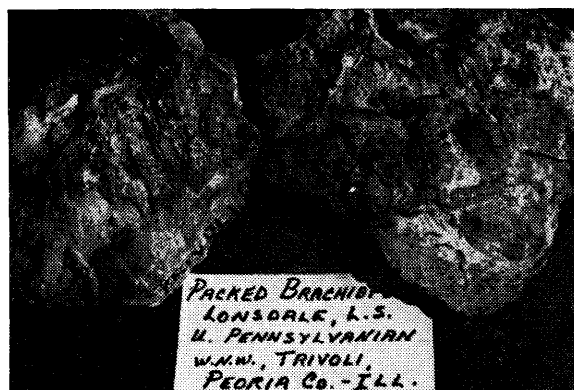


Figure 2. Randomly packed and distorted brachiopods in Lonsdale Limestone, Upper Pennsylvanian; west northwest of Trivoli, Illinois.

The cyclical and rapid deposition of Member 98 of the St. David Cyclothem of the upper middle Pennsylvanian System has been demonstrated by the writer.^{8, 9, 10}

The tectonic agencies of catastrophic deposition are recognized by Moore¹¹, Dunbar and Waage¹² and in Kummels second edition of *History of the Earth*.¹³ These include volcanism, block faulting, crustal sinking, folding, and intrusions. Moore recognized at least twelve episodes of crustal disturbances for the Pennsylvanian System alone.¹⁴ These are reflected by the occurrence of over 100 incomplete cyclothems¹⁵ in Illinois alone.

H. G. Coffin¹⁶ very ably documented the catastrophic deposition of the polystrate Joggins tree trunks in the Nova Scotia sea cliff outcrops. Dunbar and Waage exhibit a photograph of these tree trunks in the 1969 edition of their *Historical Geology*. Kay and Colbert¹⁷ speculated on the entrapment of salamanders within the hollow trunks of some of the trees. Even the Illinois Pennsylvanian limestones record rapid sedimentation. The Lonsdale Limestone of the lower McLeansboro Group (upper Pennsylvanian System) in western Peoria County, Illinois (Figure 2) shows distorted and randomly packed brachiopods.

Fossils are found in black shales of the Pennsylvanian series that should "not be there." For instance, the radiolarian, *Anthocyrtium* (Miocene protozoan); the protozoan foraminifera, *Nodosaria* (Triassic to recent), *Lituotuba* (Cretaceous), *Lagena*, *Bolovininina* and *Hyperamminoides* (Jurassic to recent); and the Conodonts, *Rhipidognathus*(?), and *Lonchodus* (Ordovician); *Trichonodella* (Devonian) and *Siphonodella* (Lower Mississippian) were reported as observed in Member 98 of the St. David Cyclothem.¹⁸

[Note: Photographs of the foraminiferan, *Lituotuba* (Figure 29; p. 43), the radiolarian,

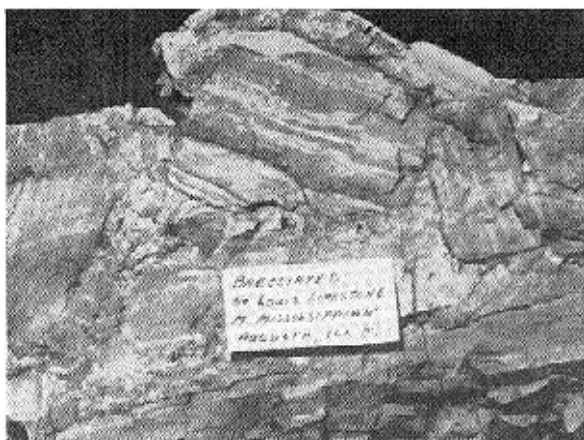


Figure 3. Brecciated St. Louis Limestone, Middle Mississippian, east of Augusta, Hancock County, Illinois.

Anthocyrtium (Figure 91; p. 81) and the Conodonts, *Rhipidognathus* (Figure 35; p. 48) and *Lonchodus* (*Centroodus*) (Figure 76; p. 70) were presented as part of the Masters Thesis.]

The writer was advised at that time that even the *Treatise of Invertebrate Paleontology*¹⁹ should not be considered the last word in paleontology. Yet each new secular biology, earth science, or geology textbook author treats as fact that animals and plants appeared in the geological time scale at specific succeeding "ages."

Mid-continent Mississippian Limestones

Mid-continent Mississippian limestones in Illinois exhibit rapid tectonic disturbances. The St. Louis Limestone (Figure 3) in a quarry east of Augusta in Hancock County contain several brecciated members. Northwest of Colchester, west central McDonough County a 15-foot member of the Burlington Limestone (lower Mississippian) in the Colchester Stone Co. quarry is severely conglomerated (Figures 4 and 5). Many of the clastics in this member are 15 to 20 inches and probably more in diameter. This limestone member was definitely fractured and re-cemented in a watery environment in a slurried condition.

Devonian Limestones

Strata of the Devonian System are well exposed in Central Western Illinois. They are referred to later in the discussion on the Ordovician.

Silurian "Polystrate" Fossils

After reading a fascinating article on Canadian Cambrian fossils by H. B. Whittington (see Reference No. 34 below) I examined several classroom specimens of Silurian Lockport dolomite. These rocks form spectacular cliffs east of Grafton in Jersey County, Illinois and overlook the Mississippi River. The trilobite, *Cal-*



Figure 4. Fifteen foot outcrop of slurried Burlington Limestone, Lower Mississippian; west of Colchester, McDonough County, Illinois.

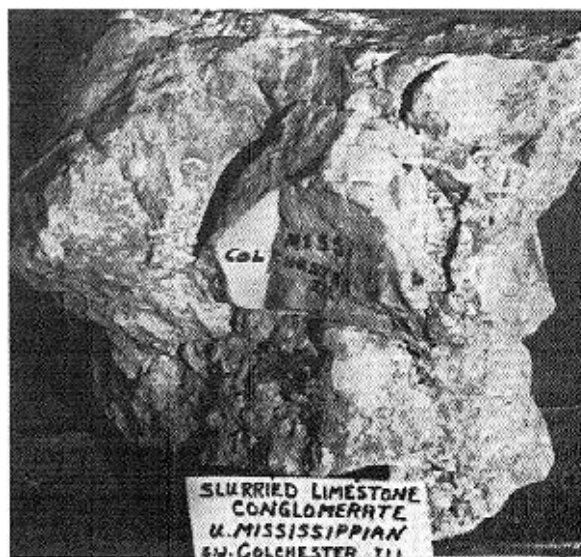


Figure 5. Closeup of slurried Burlington Limestone from outcrop west of Colchester, Illinois.

mene, is common in the lower portion of the outcrop. Figures 6 and 7 show specimens of the trilobite exposed in the dolomite samples. Three darker layers and a light layer below the fossil are labelled A, B, C, and D respectively.

Micro laminations were traced laterally from each of the fossils. Notice that the microlaminations truncate against the fossils, indicating a rapid sedimentation. Figure 6 shows two darker layers above the trilobite, which extends from a lighter layer D into the lowest darker layer C. Lines of other fine cavities (see arrow marks) seem to suggest cross-bedding, another suggestion of rapid sedimentation. In Figure 7, laminations traced by lighter colored microbedding planes have been traced with dark ink. These were traced around to the left face of the dolomite sample. The trilobite interrupts at least four microlaminations of solid dolomite. In the light of the later discussion of the Burgess Shale, catastrophic sedimentation of the Silurian Dolomite certainly seems warranted.

Catastrophic Ordovician Sedimentation

Ordovician limestones, dolomites, conglomerates, sandstones and folded rocks are directly associated with severe worldwide volcanism and crustal disruptions. Kay and Colbert in their textbook, *Stratigraphy and Life History* (Reference No. 17), display photographs of field evidence of catastrophism on pages 133, 135, 138, 139, 149, 159, 167, 168, 175, 176 and 179 related to the Ordovician System. In Illinois the Ordovician sediments also exhibit visible evidence of rapid sedimentation.

A large display sample (Figure 8) of Joachim Dolomite, lower middle Ordovician, from Batchtown, Calhoun County, Illinois clearly shows wave-marks. The lower ripple mark had a wave length of about five and one-half inches and was apparently moving toward the right. The upper wave-mark has a wave length of about nine inches and was apparently moving toward the left.

The trough of the upper wave-mark is distorted where the slurry flowed against and over a chert nodule. Notice that the cavity of the chert nodule (left side of Figure 8) shows microlaminations truncated at the edge of the cavity, which suggests that the chert nodule might have been transported to the deposition site.

Near the top of the dolomite section are at least two distinct layers of pulverized shells and calcite crystals. The base of the thicker layer of pulverized shells covered the finely rippled surface of buff dolomite (labelled R). The ripple wave length at this interface varies from half an inch to one inch, indicating a short period of settling and fine vibration. This was followed by several flows of pulverized shells. The cyclical

series of dolomite and limestone is clearly visible on the highwall of the quarry.

Cycles of (a) silicon and magnesium or dolomite(?) alternating with (b) calcite or limestone are discussed in Nairn²⁰ on page 468 of *Problems in Paleoclimatology*. And R. W. Fairbridge²¹ cited examples in the Appalachian Ordovician, mid-west Devonian, Belgium Devonian and Carboniferous, and Tertiary strata of Cuba and Jamaica. Further, Fairbridge quoted Landes' suggestion²² of a "... rhythm of a sudden retreat and slow transgression of sea water," and also Rutten's suggestion²³ of a rhythmic sequence of "... alternation between storminess and calm sea conditions."

Significant criticism of orthodox uniformitarianism is published in the work edited by Nairn.²⁴ Bucher used four paragraphs to describe alternating shales and limestones in the Cincinnati Series, Upper Ordovician. Bucher described both, a thin limestone-thicker shale formation and a thin limestone formation as "... formed by violent stirring up of the shale" (p. 595) and "... formed by exceptionally high storm-strengthened tidal currents and promptly covered by stirred-up shale settling on them." (p. 596)

All five series of strata of the Ordovician System are associated with volcanism, conglomerates and catastrophic deposition. It is therefore not surprising that the formation of dolomite itself is apparently far from settled. Donald H. Zenger of Pomona College stated last year that, in view of the many inconsistencies and disagreements between researchers, much work needs to be done concerning:

... ordered dolomite versus protodolomite versus magnesium calcites; carbon and oxygen isotopes of dolomite crystals and their relation to primary or replacement dolomites; dolomite synthesis ... kinetics of dolomite formation. ...²⁵

Widespread, violent volcanic eruptions and settling of dust rich in ferro-magnesian could supply the magnesium, and plagioclases could supply the calcium or sodium. Plagioclase feldspars supply both calcium and sodium: anorthite, 90% calcium; bytownite, 70%-80% calcium; labradorite, 50%-70% calcium; and andesine, oligoclase and albite supply increasingly larger per cents of sodium.

World-circling, continent covering gigantic tides could produce the cyclical sedimentary sequences and wave marks observed in the rock outcrops and quarries. Irregular seismic shock waves associated with crustal faulting could induce and accelerate differential compaction of freshly deposited sediments. All of these could contribute to the forces that induced continental drift as outlined by M. A. Cook²⁶ and could have

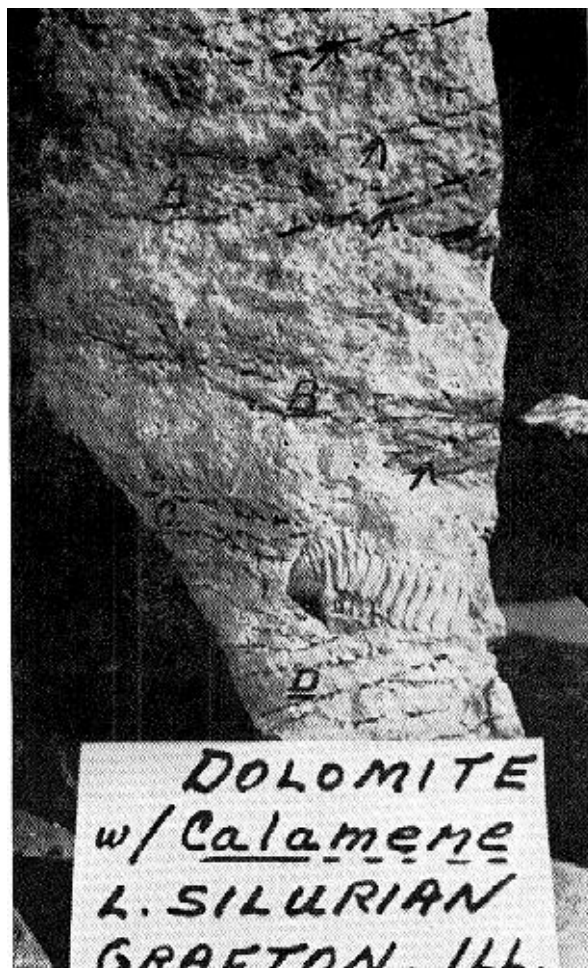


Figure 6. Trilobite, Calamene, in Lockport Dolomite, Silurian; three darker layers, A, B, and C. Fossil extends from layer D into layer C.

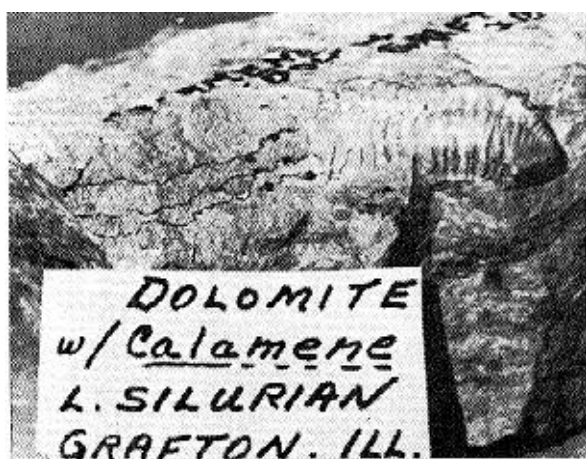


Figure 7. Trilobite, Calamene in Lockport Dolomite, Silurian; trilobite extends through at least four microlaminations, some of which are traced with dark ink to the left of the trilobite.

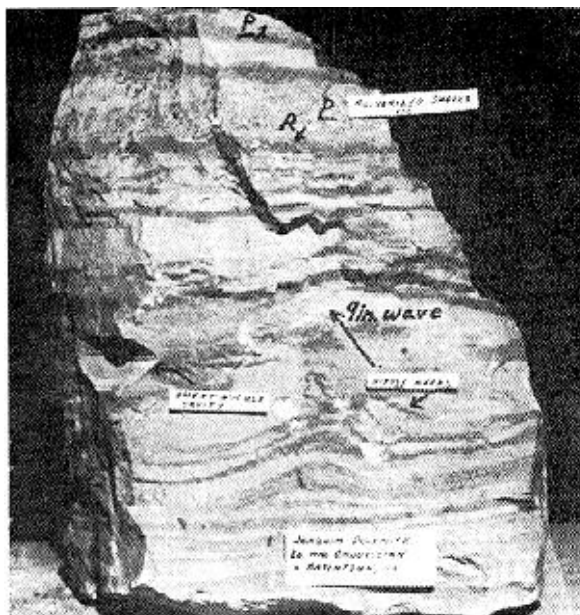


Figure 8. Joachim Dolomite, lower middle Ordovician; south of Batchtown, Calhoun County, Ill. Pulverized shells at P layers, nine inch and five and one-half inch wavemarks; and microlaminations truncated at chert nodule cavity.

accompanied the highest water levels of the Noachian Flood and its aftermath, as the waters receded and the Pleistocene ice age developed.

The deposition and composition of Paleozoic dolomites and limestones neatly coincide with the highest water levels of the Noachian Flood. Zenger cites the Ca-Mg ratios charted by Chilingir²⁷ as follows:

Table 1. Ca/Mg Ratios of Carbonate Rocks and Sediments vs Geological Age after Chilingir, 1956.

Age	No. of Samples Analyzed	Average Ca/Mg Ratio
Precambrian	70	4.0/1
Cambrian	40	4.2/1
Ordovician	100	3.5/1
Silurian	250	3.0/1
Devonian	160	7.0/1
Late Paleozoic	400	16/1
Cretaceous	85	56/1
Tertiary	50	53/1
Quaternary and Holocene	250	40/1

Standstones, shales and conglomerates dominate the Triassic and Jurassic sediments. If laboratory analysis bears out the same marked increase as in the Cretaceous, it would only emphasize more dramatically the radical change from Paleozoic sediments to those of the Mesozoic System; from Flood Epoch to Post-Flood aftermath, the "Age of Reptiles."

Such analysis would serve to reinforce the climatic suggestions of Northrup²⁸; that the environment during the recession of the Flood was wind-blown, drying, and sandy in some regions, while receding tidal invasions still deposited limestones and chalks in others. There is evidence of "Triassic" subaerial lava flows with dinosaur prints between them and other differences contrasting Paleozoic with Mesozoic strata (personal communication from S. E. Nevins, Dec. 9, 1972).

The Ubiquitous Cambrian

Bernard Kummel²⁹ describes the Early Cambrian as follows:

The miogeosynclines of the western and eastern sides of the continent were sites of extensive deposition of quartz sand derived in part from the central region, and since Middle Cambrian from areas on the seaward side of the troughs. In the eugeosynclines of eastern North America we find Lower Cambrian shales, graywackes and conglomerates.

The Mt. Simon in Illinois; the Marquette in Michigan, the McNaughton and Gog in British Columbia are the typical lowest Cambrian deposits in the "mid-continent." The Tapeats Sandstone marks the base of the Cambrian in Arizona. They form the Great Erosional Unconformity above the red sandstones, siltstones and shales of the Nankoweap formation of the "Lipallian Interval."

Beneath these are the greenish gray sills and dikes of the Rama diabase intruding through and above the bright red siltstones and shales of the Docks formation. Beneath are the other Precambrian metamorphics, conglomerates and igneous crystallines. Above are the basal sandstones of the Cambrian system.

From a Biblical perspective it is significant that the Precambrian "era" was buried under red shales, siltstones and sandstones, marking the end of a period of volcanic eruptions, igneous intrusions, volcanic sills, block faulting, rapid mountain forming and crustal rupture, the deposition of conglomerates and basaltic and felsic lavas. This seems logical because, on the day Noah and his family entered the ark: "... on that very day all the fountains of the great deep burst forth and the windows of heaven were opened."³⁰

Perhaps it is more than coincidental that most of the early Cambrian deposits are sandstones. Only after the rains had carried the continental sandstones to the "outer edges of the central continental cratons" (platforms), would the waters of the Flood rise high enough to carry and deposit the dolomites, limestones and shales in gigantic slurries born within ever deepening tidal swells and waves over successively higher elevations until all the continents were submerged.

Cambrian Fossil Deposition

The presence of seedferns (Lepidophytes), horsetail trees (Calamites) and mosses (Bryophytes) and fragments of woody stems in the Cambrian have been discussed earlier by Rusch.³¹ Pollen of evergreens (Conifers) and flowering plants (Angiosperms) in Cambrian and Precambrian deposits have been isolated evidently by Burdick and Loma Linda University workers.³² However, another restudy project on the mode of sedimentation of Middle Cambrian deposits will be of special interest to C. R. S. Quarterly readers.

I was afforded a unique opportunity and pleasure July 6, 1972 to photograph specimens on 12 slabs of the famous Burgess Shales, Yoho National Park, British Columbia. Dave Nielsen, Park Naturalist, also gave me copies of three complete articles authored by Canadian and British geologists dealing with the tectonic and sedimentary aspects of the formation of the Middle Cambrian Burgess Shale at Field, British Columbia.

Photographs made from 35 mm color transparencies still illustrate the polystrate nature of the fossils in the Stephens Formation, *Ogygopsis* Shale of the lower middle Cambrian System from Mt. Stephen and Mt. Wapta.

Figure 9 shows *Ogygopsis* trilobite above and *Olenoides* below and to the right. *Olenoides* clearly interrupts a microbedding plane at point A. Figure 10 shows several sea worms (Polychetes) partially exposed. Notice that the lower (right or left hand) member of the paired appendages of the worms A and B are buried in the next lower bedding layer of shale and not visible.

H. B. Whittington of Sedgwick Museum, Cambridge, England, has presented³³ detailed microlamination and photographic studies of fossils in Burgess Shale. He has described carefully the orientation of the fossils, which extended through several bedding planes. None were within single laminations.³⁴

Six to 39 per cent of the fossils were buried at angles oblique to the bedding planes. Five to 13 per cent "... of the individuals in the five samples taken from the 'Phyllopod bed' are

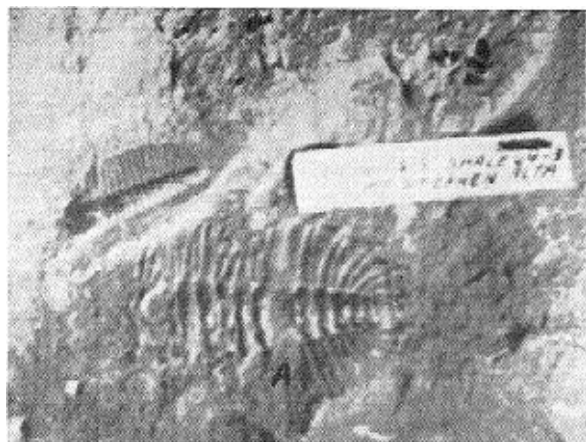


Figure 9. Burgess Shale, lower middle Cambrian from Mt. Stephens. Yoho National Park, south of Field, British Columbia, Canada. Point at which fossil; *Olenoides* (trilobite) extends from one lamination to another, marked A; Trilobite, *Ogygopsis*, above and to the left.

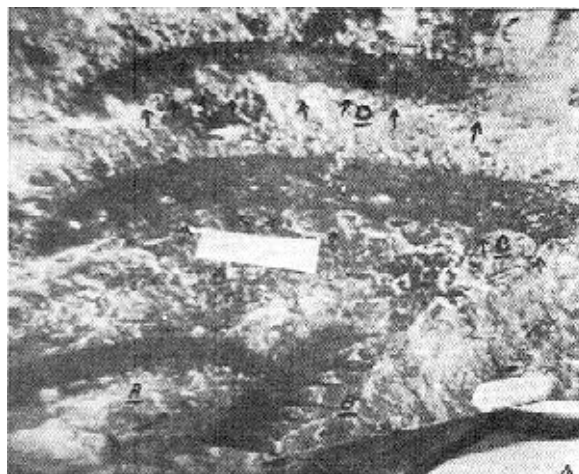


Figure 10. Portions of four polychete worms (Annelida) in Burgess Shale from Mt. Stephens. Yoho National Park, British Columbia. Worms buried lateral to bedding plane. Microbedding lamination (solid shale) separates paired appendages, covering buried member of pairs (A, C, and D).

compacted in an attitude approximately lateral to the bedding.³⁵ Whereas 56% to 81% of the specimens were parallel to the bedding planes:

... It may be observed that the appendages do not lie in exactly the same bedding planes as the spines of the cephalic shield, but that they lie on different levels. The gill branches overlap one over the other, are inclined downward and forward relative to the cephalic spines, and there is a thin layer of rock separating them from the gill branches (Figures 8 and 9).³⁶

Whittington used 18 photographs and six drawings to document his observations.

The mode of deposition suggested by Whittington is presented in several paragraphs.³⁷ In the first paragraph he states:

A benthic population could have been catastrophically overwhelmed by a moving cloud of suspended sediment, the animals being entombed in a wide variety of orientations as the sediment settled. The delicate animals were not torn apart, but were buried with appendages such as gill branches and walking legs in natural relative positions, not twisted or disoriented.

He then suggests that they were buried only a short distance from where they lived by a slow moving current of sediment. However in the second paragraph he continues:

A series of such catastrophic burials at irregular intervals could have produced the present fossiliferous layers (Figure 5). The chemical conditions that obtained in this sediment during diagenesis are problematical.

Presumably the relatively rapid burial preserved the animals from predation, and there was little or no decomposition nor are signs of burrowing infauna.

In the third paragraph he suggests that the waters were relatively deep: "... (several hundred feet) off a limestone bank, an environment where a thick shale sequence was accumulating rapidly." Finally Whittington states:

If the rare Burgess fauna and flora were a single community: ... why are tracks, trails and burrows absent? ... Favourable conditions for its burial and preservation occurred for only a short interval during the accumulation of a thick shale sequence.³⁸

S. E. Nevins (in the same personal communication cited above) states that rapid burial such as this requires that the shale be formed from flocculated clay particles, distinctly unlike the deposition of modern red clays in ocean deeps from unflocculated clay suspensions. And Whittington re-emphasized his assertion of extremely rapid burial of the Burgess fauna in his 1971 report.³⁹

Soft-bodied worms (Annelids and Polychetes), medusae of coelenterates, Arthropods including trilobites and sponges are among the 150 species found in the Burgess Shales. This unique formation is located on Mt. Stephens and Mt. Wapta, south and north (respectively) from Field, British Columbia in Yoho National Park. I climbed to the *Ogygopsis* shale on Mt. Stephen in July, 1972, but snow on the paths prevented any further hike to the Mt. Wapta outcrops.

Conclusions

The Paleozoic field evidence is found in quarries, erosion outcrops, fault-block mountains, folded metamorphic rock series, and volcanic features. There are repeated evidences of cataclysmic forces and events. Integrated with the

Genesis account of the Flood, they can provide very good visible evidence. Even the rocks "speak out" in testimony to the everlasting truth and veracity of the Bible. They can be used to form a firm foundation for the believer, and a formidable challenge to the unbiased scientist.

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ANOMALOUS MAGNETIC FIELD MIXING IN CHROMIUM (III) CHLORIDE

LEE GREGORY KENT*

Foreword

GEORGE MULFINGER**

Nuclear quadrupole resonance (NQR), although potentially an important research tool, has not yet gained widespread use or popularity. It is our good fortune to have a pioneer in this field, Dr. Lee Gregory Kent, as a member of the Creation Research Society. Dr. Kent has kindly consented to publish his latest work first in the C.R.S Quarterly because of its possible significance for creationism.

On the basis of evolutionary presuppositions (i.e., evolution in the broadest sense of the word, as "cosmic evolution"), one should expect to find a gradation in properties from one member of a family of similar compounds to the next. Yet the results presented here do not fit such a picture. Chromium (III) chloride is seen to be unique among all the compounds studied, despite the fact that over 100 substances were investigated, many of them very similar to CrCl_3 in structure. In other words, we have at this point, in any sequence of related compounds one might wish to envision, a marked discontinuity in at least one readily measurable property.

Creationism can provide a framework for comprehending either a graded series or a group of discrete entities with "random" properties. Proponents of the evolutionary approach, on the other hand, must by its very nature founder when faced with discontinuities. Because the field discussed herein is somewhat new and uncharted, and because several esoteric questions of a philosophical nature are raised, it will be left to the reader to determine whether the property investigated in this work does indeed constitute a significant discontinuity, and how strongly such evidence militates against an evolutionary explanation of origins.

The technique utilized consists of subjecting a solid sample of the compound under study to crossed AC fields, and measuring its response as the frequency of one of the fields is varied. Resonances, attributable to changes in the positions of the nuclei in the sample, are detected at characteristic frequencies. Chromium (III) chloride exhibits such a resonance as do other compounds, but in addition causes the anomalous shifting of the entire baseline of the recorder output. This remarkable phenomenon is still unexplained.

Background

Searches for nuclear quadrupole resonances (NQR) yielded insight into a phenomenon intriguing, enigmatic, apparently unique, and unrelated to the initial study. A word regarding NQR and its detection will underscore the anomaly.^{1,2}

The nuclei of about 25 atoms are non-spherical in shape. If the chemical (electronic) environment in which these nuclei are located is also non-spherical, they will orient themselves in a "preferred" direction, since unlike charges attract. This nuclear position gives the system a slightly lower energy than would any of the less-desirable allowed positions.

Normally a system does not exist at any randomly-chosen energy. Only a small number of quantum states is possible, the exact number being determined by nuclear properties. That of lowest energy is referred to as the quantum ground state; the one or two less-desirable (i.e., higher-energy) orientations that might exist yield "excited" quantum states.

One may determine the difference in energy between the ground and first excited states by placing about five grams of solid sample into a 15 mm diameter test tube, and, in turn, inserting the test tube into the coil of a superregenerative oscillator (SRO), Figure 1, bottom. When the SRO is oscillating at a frequency exactly corresponding to the energy necessary to move the nucleus from its ground state to the next higher possible quantum state, the sample absorbs energy and the transition is temporarily effected. Information regarding chemical bonding and crystal structure is gained from the frequency, breadth, and intensity of absorption at various temperatures and pressures.³⁻⁶

NQR is analogous to nuclear magnetic resonance (NMR). The "preferred" nuclear orientation is determined by the interaction of the magnetic dipole of the nucleus with an externally-applied, magnetic field.⁷

This paper is based on NQR studies that covered the range 1 – 300 MHz; very few resonances have been found beyond these limits.^{8,9} Detection was accomplished by placing the sample in a vacuum-sealed vial inside the coil of an SRO of the type commonly used in "hiss-box" receivers and walkie-talkies.

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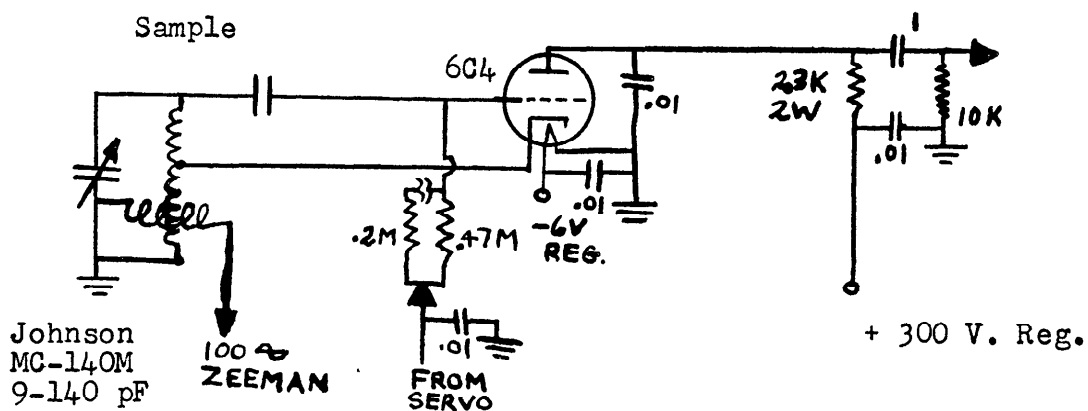
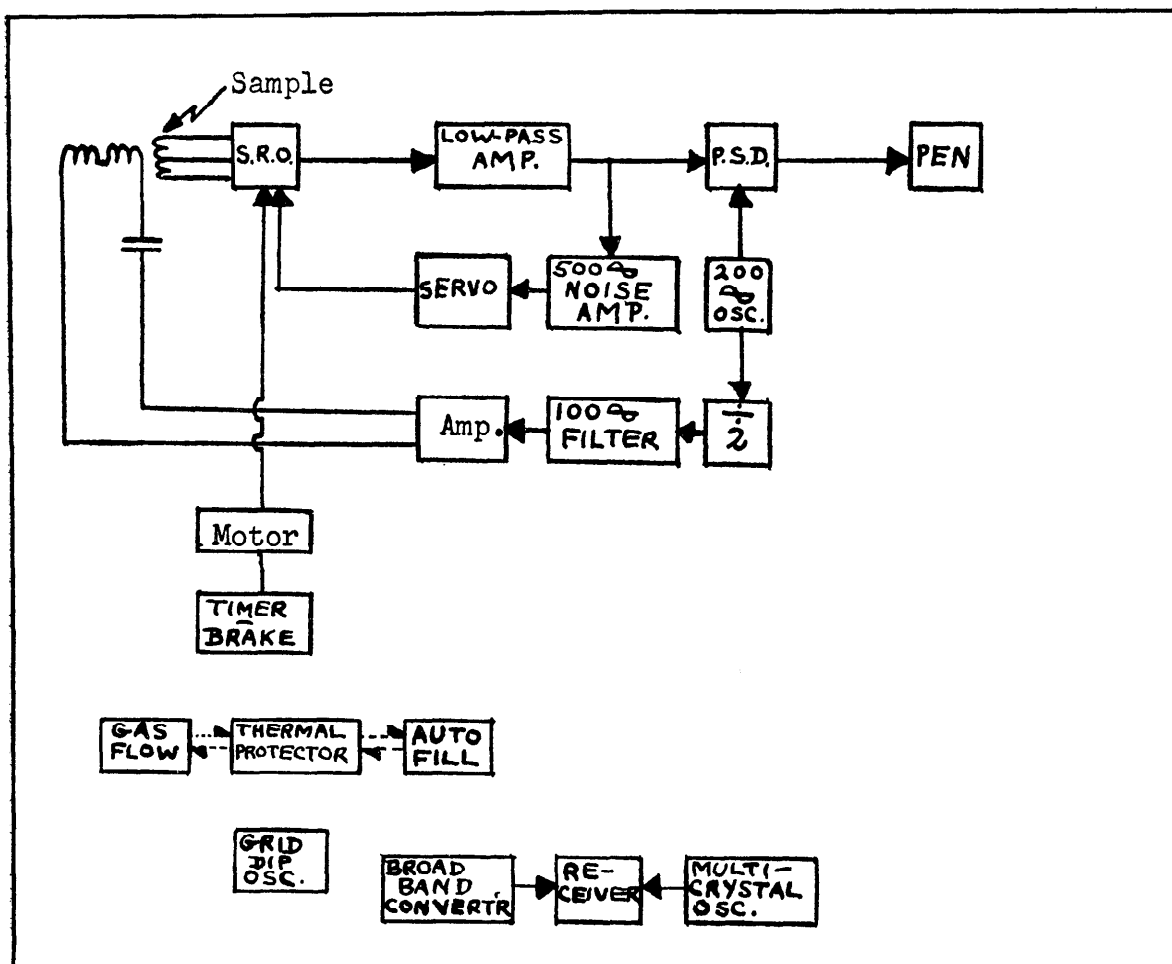


Figure 1. Top: Block Diagram of Detection System; Bottom: Superregenerative Detector Schematic.

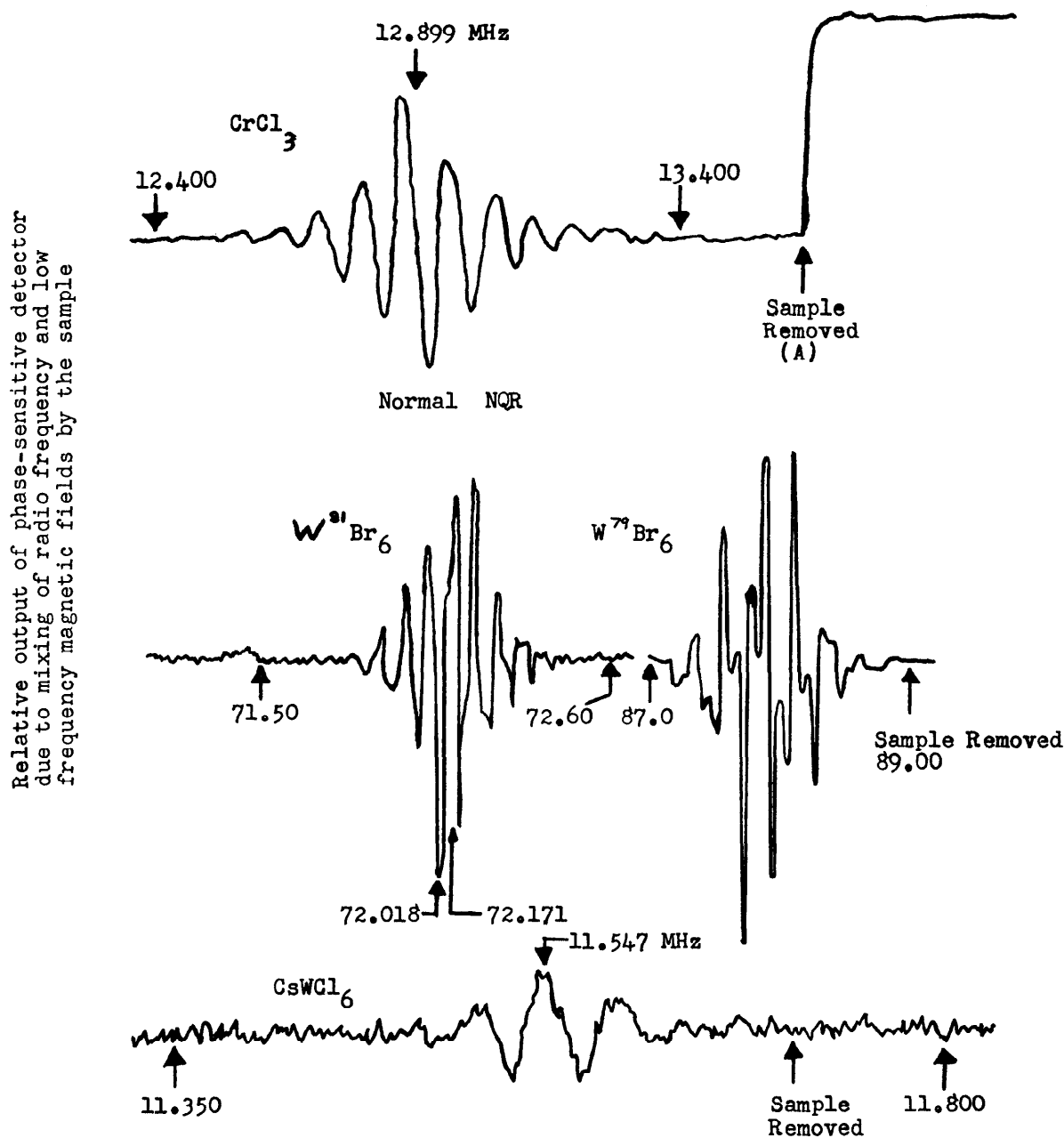


Figure 2. Examples of Recorder Output, including Magnetic Feedthrough Anomaly (CrCl₃).

Tuning was motorized to cover a 2:1 frequency ratio in about 10 hours. Considerable shielding was necessary to avoid reception of radio and TV signals, appearing as sound in the loudspeaker output, and as extraneous ripples in the chart recorder output. To aid in detection, a 100-Hz – 100-gauss magnetic field was placed at a 90° angle to the radio-frequency (RF) field.¹⁰

This "Zeeman" frequency did not appear in the SRO output unless mixed with the RF by

the sample. Mixing occurs only at the critical radio frequency by virtue of the fact that energy levels shift in the low frequency Zeeman field involved in the quadrupolar transition. The Zeeman field is merely used as a "gimmick" to facilitate detection. In the case of extremely strong NQR absorptions the Zeeman frequency (actually, the second harmonic, or 200 Hz) could be heard in the loudspeaker.

Sensitive quantitative results were obtained by passing the SRO output into an extremely

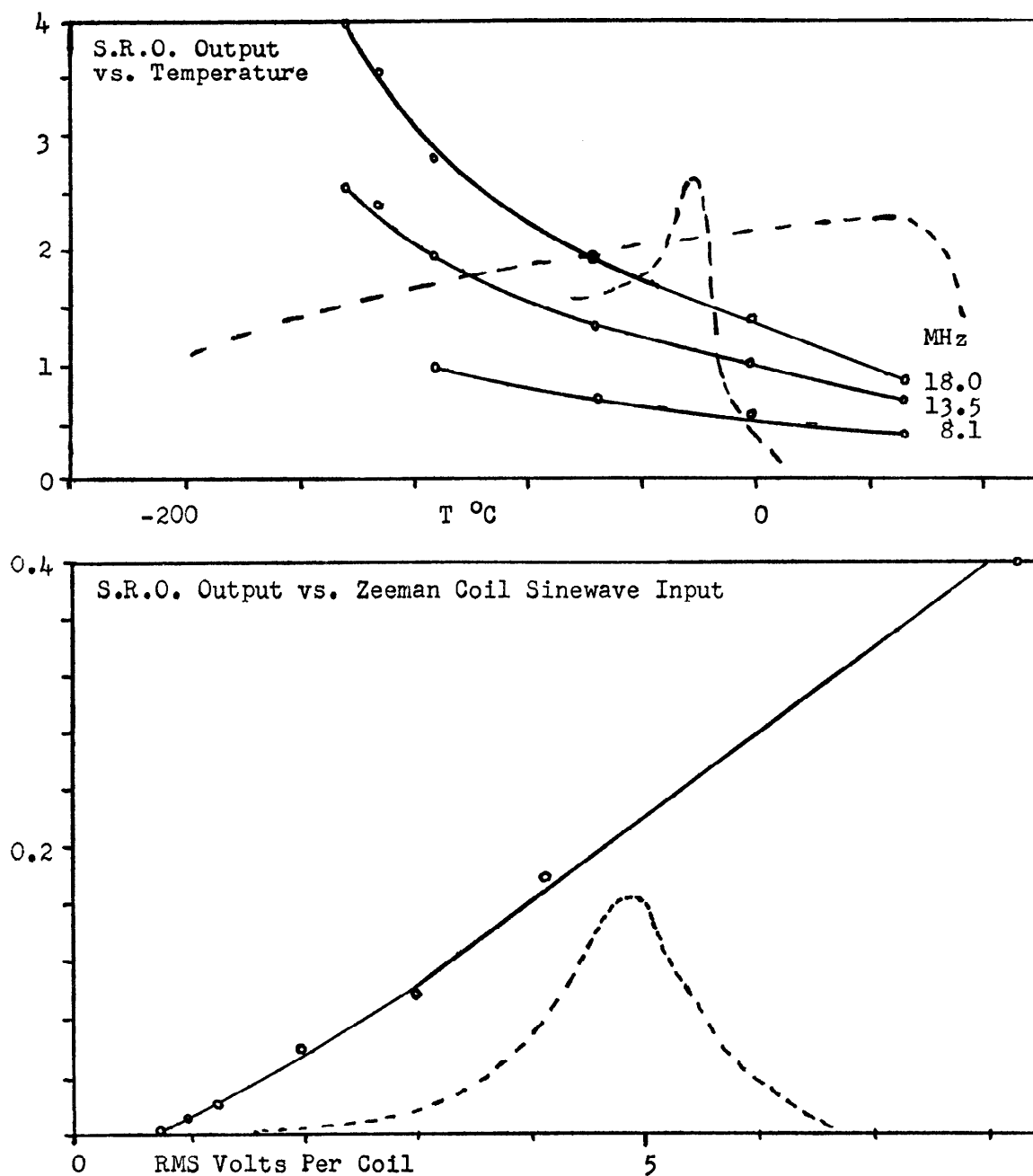


Figure 3. Magnetic Feedthrough in Chromium (III) Chloride.

stable and selective filter (a phase-sensitive detector, PSD) to discriminate against noise, then into a continuous chart recorder, yielding traces typified in Figure 2. A block diagram of the RF, Zeeman, scanning, thermostating, and monitoring systems involved is seen at the top of Figure 1. Each of the two Zeeman coils consisted of one pound of #16 enameled wire on an aluminum spool $\frac{1}{8}$ " thick, 1.3" wide, with minimum and maximum diameters of 1.6" and 4".

Field Mixing in CrCl_3

The anomaly treated in this paper is seen at the top of Figure 2 as a permanent shift in center (base) line, at the arrow (A), upon removal of the sample. The sample was removed shortly after the normal NQR resonance was scanned to underscore the effect. The x-axis position of sample removal is noted for two normal NQR scans; no base line offset is noted.

CrCl_3 is essentially unique in exhibiting this shift, which arises from mixing of the Zeeman and resonant RF fields beyond the normal NQR frequency, shown at the left of the offset. Were there no anomaly, the entire signal to the left of (A) would be shifted upward; no ledge would appear at (A).

The effect is independent of the angle between RF and Zeeman fields. It bears the intensity dependences on ambient temperature and Zeeman magnetic field intensity noted in Figure 3. For NQR, both dependences exhibit maxima; typical curves appear in dashed lines. The effect bears audio output equal in frequency, phase, and approximate amplitude to that seen in normal NQR. It is essentially uniform in intensity over the frequency range 8–100 MHz, and is seen in all samples of CrCl_3 of various sources and ages.

The quench frequency (hiss) in the SRO is essential for sensitivity in detecting NQR signals; it is unnecessary, and even of some hindrance in detecting the anomalous effect. A small sample placed inside the coil of a Millen Grid Dip Oscillator yields almost invariant output from 8–66 MHz, decreasing to 65% at 82 MHz and 5% at 118 MHz, uncorrected for circuit Q.

Over 100 compounds, ranging widely in magnetic characteristics, effective atomic number, oxidation state, coordination, bonding, history, and crystalline form, were investigated for this anomalous mixing of fields: many transition metal complexes, cuprous oxide (noted for an extremely strong NQR absorption), a few organic halides, inorganic chlorates, halides, phosphates, nitrites – to name some of the categories. Of these, only FeCl_3 seems to exhibit a similar effect. That is only 7% as intense as is CrCl_3 's; no NQR for FeCl_3 was obtained. At 80 MHz, feedthrough level for FeCl_3 is below that of ambient noise, or about 1% on the scale discussed.

The interaction is indeed one between the Zeeman magnetic field and the RF magnetic (H) rather than RF electrostatic (E) field. Although in space transmission, several wavelengths from an antenna, the two fields travel together orthogonally, they may be isolated from each other, practically, at the resonant circuit elements involved: CrCl_3 was placed between the plates of a small brass-molded capacitor carrying 15 MHz SRO tank energy; application of a strong Zeeman field failed to show mixing, eliminating E-field as a possible path. To rule out the possibility that supernatant gas might be the non-linear medium necessary and sufficient for the mixing of the two fields, evacuated and room-pressure systems were tried, with spaces above the samples placed in the crossed fields. Later, HCl adsorbed on silica gel also yielded no signal.

The interaction did occur in semiconducting junctions, Iron/Iron-Constantan thermocouples, and some casual electrical contacts, hence they were kept away from the fields during this investigation. Neither magnetic nor non-magnetic steels caused mixing; neither iron nor iron-constantan wires alone gave the effect. CrCl_3 residual feedthrough is, because of its stability and universality (over various heat treatments and origins of sample), used as a standard for our NQR equipment adjustments.

The Nature of the Effect

What is the mechanism operative in this interaction of fields? In NQR, mixing occurs (as in NMR) by virtue of a magnetically-induced shift in quantized energy levels, moving the absorbed RF out of the detector's tuning range. In the studied NQR system, this shift was accomplished in the Zeeman field 200 times per second; in most NMR systems higher frequencies are used. No such resonance is involved in the anomalous (CrCl_3) mixing: it occurs over a wide range of radio frequencies. Also, the Zeeman field acts, through the sample, upon the RF field independently of the polarity of the Zeeman field, i.e., the North and South poles are identical in their effects. The effect is independent of the thermal and preparative history of the sample and thus is different from sporadic crystalline effects, such as F-centers, or semiconducting nonstoichiometries in the CrCl_3 microcrystalline lattices.

To elucidate the mechanism, single crystal studies are needed, noting the plane orientation with respect to the two fields. Shaped pulse work should show whether the Zeeman field acts to degrade absorption of RF energy by the sample or to enhance it (as is suspected from the nearly linear relationship in Figure 3, bottom).

Reflections

At this point, no mechanism for the interaction can be proposed. Notably lacking are similarly behaving substances; hence only the data are presented, and suggestions for further investigation are made. The number and types of compounds studied for this effect serve to impress the author with the unique nature of CrCl_3 .

Because of uniformitarian dogma in the sciences, one's conditioned response would be to expect a series of related compounds to exhibit varying degrees of similar behavior. Paucity of success thus far does not, of course, preclude the existence of such a series.

However, this investigator is reminded of the many other examples where the "grey area" is thin: (a) ferromagnetic materials in nature; (b) facile long-chain formation in nature—practically exclusively the domain of carbon; (c) boron's cages; (d) the unique nature of water in its expansion below 4°C; (e) the bodies of

the universe in their orbits (very non-uniform/non-random; (f) and the most problematic: quantization of energy levels!

Scientists seem to gravitate toward the desire for continua—of fossils, of energy states, of behavior in naturally occurring compounds across the periodic table. Were one, though, without this emotional commitment or desire for a continuum (perhaps born of each man's need for a connection with the whole plan of things—for the time-based security of Linus' blanket) his thinking would be freed of uniformitarian bias.

Men of God in science are not so bound. Were they capable of objectivity in this area they would choose a creationist stand rather than that of the evolutionist, and would do so on scientific evidence alone. The faith required to fill

in vast gaps ("missing links") is staggering, not only in the realm of biological and geological evolution, but, as noted in this article, in the realm of materials behavior, at the microscopic and macroscopic levels.

Such faith is great in mass and fantastic in quality if one considers merely the scarcity of continua. By adding the questions of the origin of the first Energy-Mass and of design probability (even allowing for a generous supply of "natural selection"), the faith required becomes humorous. How much more logical to believe in the all-wise and all-powerful Creator who planned and shall consummate the four dimensions in which we move! But one cannot be logical or objective in this regard without a life regenerated by this Creator—and Savior.

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HOW MANY ANIMALS IN THE ARK?*

ARTHUR J. JONES**

Biological arguments against a universal flood are answered through a comprehensive study of the relevant Biblical and scientific evidence. Biblical evidence bearing on the following points is studied: animal groups represented on the Ark, animals classed as clean, number of animals taken from each clean kind, and the gathering of the animals to the Ark. This is supplemented by a biological study of the number of kinds, the relative diversity of clean and unclean animals, and the problem of hibernation. It is concluded that biological arguments against a universal flood are invalid, and that the number of animals under Noah's care probably did not exceed 2,000.

1. Introduction

In the continuing debate over *The Genesis Flood*,¹ one particular group of criticisms has not been answered adequately. These criticisms are usually presented as a series of questions centering around the number of animals in the Ark:

(1) How was it possible to gather representatives of every type of animal?

(2) How could room for so many animals be found on the Ark?

(3) How could eight people feed and care for all these animals?

(4) If only a smaller number of creatures was involved—representatives of the main "kinds" or "orders" of animal life—then we have the evolution of thousands of new species in a far shorter time than the most ardent evolutionists have ever believed possible. Does belief in a universal Noachian Flood entail belief in extremely rapid evolution?

This article is an attempt to provide a comprehensive reply to these criticisms. The first

*This article is the third in a series dedicated to the memory of Dr. Jacobus Johannes Duyvené, de Wit (1909-1965), late Professor of Zoology, University of the Orange Free State, Bloemfontein, South Africa. The other two articles in this series are found in the *Creation Research Society Quarterly*, 9(1):53-57, June 1972; and 9(2):114-123, September, 1972.

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three sections contain a review of the Biblical evidence and the subsequent sections analyze the relevant taxonomic data. On this basis upper and lower estimates of the number of animals taken into the Ark can be provided.

2. Animal Groups Taken into the Ark

Any attempt to discover the limits of the groups represented in the Ark entails a thorough analysis of the usage of the Hebrew terms involved. This usage has been summarized in Figures 1-5 of the first article² in this series to which reference should be made.

Representatives of all the major groups of animals were taken into the Ark except the water swimmers (*sherets hammayim*)—no water-dwelling groups are listed.³ But—and this has generally been overlooked—the terms are heavily qualified to make it clear that Noah did not take representatives of all the subdivisions. All the subdivisions of beasts (*chayyah*) are included,⁴ but invertebrate land swimmers (*kol marbeh raghlayim*) and swarming fliers (*sherets ha'oph*) are excluded, i.e. Noah was given no instructions concerning invertebrates. This is such an important point that the evidence must be given in full, as follows:

(1) All the animals taken into the Ark are described as *basar*, "flesh." This term (when used of whole living animals rather than simply the animal body) is never used of invertebrate animals.

(2) "the life (*nephesh* "soul") of all flesh is the blood of it" (Lev. 17:11, 14; Deut. 12:23; Gen. 9:4). In the Biblical and everyday sense, invertebrates do not have blood (Heb. *dam*).

(3) *Basar* is qualified by the phrase "*asher bo ruach chayyim*," "which has in it the spirit of lives" (Gen. 6:17; Gen. 7:22). This additional phrase is likewise never used of invertebrates.

(4) In Genesis 7:14 *kol ha'oph* (every flier) is defined (through apposition) as *kol tsippor kol kanaph* (every bird every wing i.e. every bird of every sort).⁵ The phrase *tsippor kanaph* definitely excludes insects.⁶

Thus only the following groups were taken into the Ark: (1) all birds, (2) all land-dwelling reptiles and mammals,⁷ (3) possibly some of the more terrestrial amphibia.⁸ This is not to say that land invertebrates were not present on the Ark (it would be impossible to exclude them!), but simply that Noah did not have to make arrangements for them nor to take them onto the Ark.

3. Clean and Unclean

3.1 Animals classified as "clean"

It is difficult to determine exactly which groups were regarded as "clean," but a survey of the Biblical references to animals legally used for sacrifice and (in the Post-Flood era) for food⁹

suggests that only the following groups were included:

(1) Cervoidea: deer (Cervidae); giraffes (Giraffidae).

(2) Bovoidea: pronghorns (Antilocapridae); cattle, antelopes, sheep and goats (Bovidae).

(3) Columbiformes: pigeons (Columbidae); dodos (Raphidae); sandgrouse (Pteroclididae).

(4) Galliformes: megapodes (Megapodiidae); curassows (Cracidae); grouse (Tetraonidae); pheasants (Phasianidae); guineafowl (Numididae); turkeys (Meleagrididae).

(5) Passeres many families of song bird—sparrows, finches, etc.

(6) Probably also ducks, geese and swans (Anseriformes, Anatidae).

3.2 Two by two

The first command given to Noah was that he was to bring the animals into the Ark in pairs: "pairs (*shenayim*, collective¹⁰) of all you shall cause to come into the Ark" (Gen. 6:19). Later he was instructed as to the *number* of pairs which he was to take: *one* pair of each unclean kind, but *seven* pairs of the clean *behemah* and clean birds (Gen. 7:2-3). The only point which needs to be discussed here is the question of the number of clean animals, since commentators are divided between "seven" and seven pairs.¹¹ The arguments for "seven" are as follows:¹²

(1) Hebrew parallels support "seven."

(2) "Seven, seven" (Gen. 7:2-3) is a most clumsy method of trying to say "fourteen" (which is usually "*arba asar*," four (and ten)).

(3) The seven consists of three pairs and one supernumerary which Noah could conveniently offer for sacrifice after the Flood (Gen. 8:20). Significantly Man also comes from three pairs—the three sons of Noah and their wives.

(4) For what reason would Noah have to crowd the Ark with so many extra clean animals?

Although most creationists have accepted these arguments, they do not seem to be valid; for the following reasons for each of the four arguments:

(1) True Hebrew parallels (i.e. repetition of the numeral only) are in fact quite scarce,¹³ the following being all that I can discover: a) Gen. to you *seven seven* man and his wife" = ?, b) Gen. 7:3—"also from (all the clean) fliers of the heaven (you shall take to you) *seven seven* male and female" = ?, c) Num. 3:47—"you shall take *five five* shekels for a poll" = "*five shekels for each poll*," d) Num. 7:86—"twelve golden pans . . . *ten ten* (shekels) the pan" = "*ten (shekels) each pan*," e) I Chron. 26:17—"to the storehouses *two two* (Levites)" = "*two (Levites) for each storehouse*," f) Ezk. 10:21, "*four four* faces to one (cherubim)" = "*four faces to each one*."

Less exact parallels (i.e. repetition of both numeral and antecedent) are more common,¹⁴ e.g.: g) Ex. 36:30—"two sockets two sockets under one board"="two sockets under each board"; h) Num. 34:18—"one prince one prince from a tribe"="one prince from each tribe";¹⁵ i) Isa. 6:2—"six wings six wings to one (seraphim)"="six wings to each one," Cf. Num. 17:2—"rod rod for a father's house"="a rod for each father's house."

Those commentators who state that this repetition of the noun expresses distribution are clearly correct. However this does *not* settle the issue in favor of "seven," because the meaning of Genesis 7:2-3 hinges not on the idiom "seven 7:2—"from all the clean behemah you shall take seven," but on the antecedent. The distributive numeral always has an antecedent, either expressed (see nos. c & f above) or clearly understood from the immediate context (see nos. d & e above).

In Genesis 7:2 I would suggest that the antecedent is "man and his wife." In this verse the phrase "from all the clean *behemah*" occupies an emphatic position at the head of the sentence. Its normal position would be after "man and his wife," i.e. "you shall take to you seven man and his wife (i.e. seven mated pairs) from each and every *behemah*."¹⁶ The evidence for this interpretation is as follows:

Firstly, if "man and his wife" is not the antecedent, then none is available. In all other cases the antecedent immediately accompanies the distributive (or is so understood), or is actually included in the repetition. Thus this interpretation brings Genesis 7:2 into exact parallel with the cited references.

Secondly, in Genesis 7:2 we have the unusual phrase "*ish we'ishto* 'man and-his-wife"¹⁷ instead of the usual "male and female" which is resumed in verse three.¹⁸ The phrase "*ish we'isshah*" means simply "man and woman" but "*ish we'ishto*" specifically designates a married couple. In such a context as Genesis 7:2 "*ish*" also carries a distributive connotation, i.e. "every male with his mate."¹⁹ This decisively supports our interpretation.

To interpret the verse as "seven of each kind" is to create a major problem—the unpaired supernumerary—for which the text provides no solution but only aggravation. Four times (Gen. 6:19-20; 7:2-3, 8-9, 15) the account emphasises that all the animals were taken into the Ark in pairs. The account also makes it clear that the purpose was propagation: "to keep seed alive upon the face of all the earth" (Gen. 7:3).

Thirdly, "In the case of the unclean animals we have *shenayim* (two) once, i.e. 'one pair', and we may reasonably presume that had the nar-

rator intended seven individuals here, we should have had *shibh'ah* (seven) once."²⁰

(2) "Seven seven" is indeed a clumsy method of saying, "fourteen," but Moses didn't want to say, "fourteen"! He is establishing the principle of *mated pairs* and for this the Hebrew "four ten" is quite inappropriate.

(3) The numeric argument is hardly coercive. There is no Biblical reason why there should be a stock of three pairs, nor, in fact, are we told how many animals from each kind were sacrificed.²¹ If any significance is to be given to the numbers then it should be remembered that in Biblical numerics both two and fourteen signify some form of separation. Be that as it may, the presence of supernumerary animals on the Ark is very unlikely.

(4) The prime object of this article is to demonstrate that there was no population problem on the Ark! Since the number of clean kinds is relatively small, the interpretation "seven pairs" has only a small effect on the calculated total.

The reason for the taking of seven times more clean animals than unclean seems straightforward: firstly, clean animals were required for sacrifice; secondly, they would be required to provide clothing and food (cf. Gen. 9:3) after the Flood (the environment being radically changed); thirdly, as these were becoming vulnerable prey animals they required a head start for survival (cf. Gen. 7:3).²²

4. The Number of "Kinds" in the Ark

In the second article²³ of this series, it was demonstrated that the Biblical Kind is generally equivalent to the *family* of our current vertebrate classifications although the separate created kinds may have been much smaller in scope than the "Families" of modern taxonomy. This being so we can at last make some meaningful calculations.

The following figures for vertebrate families can be extracted from the lists compiled by Romer:²⁴

Table One: Vertebrate Families

	Living	Extinct	Total
Amphibia	23	58	81
Reptilia	38	192	230
Aves	155	39	194
Mammalia	125	163	288
	341	452	793

The total figure of 793 is subject to two reductions. Firstly, many Amphibia must be excluded. I would in fact argue that few if any of the 81 families were represented on the Ark. (See Reference and Note no. 3 again.) Secondly, all water-dwelling groups must be excluded.

These comprise the following 84 families:

(1) Reptiles: Mesosaurs (Mesosauria), Turtles (Chelonina), Mosasaurs; water snakes; sea snakes (Squamata: Mosasauridae, Acrochordidae, Hydrophiidae), Crocodiles (Crocodylia), Nothosaurs, plesiosaurs (Sauropterygia), Placodonts (Placodontia), and Ichthyosaurs (Ichthyosauria).

(2) Mammals: Dolphins, whales (Cetacea), Seals (Pinnipedia), and Dugongs, manatees (Sirenia).

A conservative estimate of the number of kinds to be cared for by Noah is thus 628 (i.e. 793 — 81 — 84). For a liberal estimate, two factors which enlarge the total must be considered. Firstly, there must surely be some extinct families, fossil remains of which have not yet been discovered (and perhaps never will); and, secondly, some of the families listed by Romer almost certainly comprise several "kinds."

I feel that these sources of error are to some extent balanced out by those families (e.g. amongst bats and song birds) which comprise only a part of a kind, but 800 may fairly represent the end of the range of kinds. Thus between 628 and 800 kinds were taken into the Ark, 700 being about the figure I would favor.

5. The Number of Animals in the Ark

5.1 Clean and Unclean: Diversity and Paucity

In order to convert the total number of kinds into a total number of animals, we need to know the number of clean kinds. This presents a major problem, but the analysis is very revealing. The problem is the familiar one created by "splitting" and "lumping," i.e. some workers "lump" a diversity of forms into one taxa of a particular rank, whereas others "split" the group into several taxa of that rank. The point of interest, however, is that at the family level this problem especially — and often exclusively — attends the groups of clean animals.

On the whole unclean animals fall into clear-cut, basically homogeneous groups and present few taxonomic problems at the family level. A few quotations will illustrate this. Of the perching birds Van Tyne and Berger write, "there is considerable disagreement both on the number and arrangement of passerine families," while in contrast "many (avian) families are so well marked that there is not the slightest disagreement among ornithologists about which species should be included in those families."²⁵

This difference is easily emphasized by comparing the work of Van Tyne and Berger with that of Thomson.²⁶ Van Tyne and Berger list 101 extant non-passerine families, Thomson lists 98—a 3% difference. But whereas Van Tyne and Berger list 67 passerine families, Thomson lists only 56—a 16% difference!

If we turn to the deer, we find Simpson writing, "Almost every genus of living cervids has been taken as type of a supposedly distinct family."²⁷ Of the bovids Ellerman and Morrison-Scott write, "This family is very difficult to classify and no two authors agree on the various subfamilies or minor divisions, some of which seem to be indefinable and unconvincing."²⁸ Simpson writes that with the possible exception of some rodents, the Bovidae is "the most difficult of all mammalian families from a taxonomic point of view."²⁹ Gray,³⁰ for example, split the bovids into fifteen families!

Several creationists have noted this situation; and pointed out, that there seems to be a definite correlation between the greater number of clean animals taken into the Ark and their present diversity, as compared to the single pair of unclean animals and their present paucity.³¹ A detailed comparison abundantly confirms this suggestion. In Tables Two and Three I have set out the extinction ratios for clean and unclean hoofed animals (*behemah*):³² the contrast is quite evident:

Table Two: Extinction Ratios for Unclean Hoofed Animals

FAMILIES		GENERA	
% extant	% extant in Pleistocene ³³	% extant	% extant in Pleistocene ³³
25.0	31.8	5.7	15.3

Table Three: Extinction Ratios for Clean Hoofed Animals

FAMILIES		GENERA	
% extant	% extant in Pleistocene ³³	% extant	% extant in Pleistocene ³³
100	100	26.3	62.2

5.2 The number of clean kinds

With this background we can turn to an analysis of the clean families. In most cases the number of currently recognized subfamilies will be adopted as a liberal estimate of the number of kinds.

(1) There are two families of Cervioidea, the Cervidae comprising four subfamilies,³⁴ and the Giraffidae three. This gives a range of 2-7 "kinds."

(2) The Bovoidea comprises two families, of which the Antilocapridae contains two subfamilies and the Bovidae five. This gives a range of 2-7 "kinds."

(3) The Columbiformes contains three clean families which comprise seven subfamilies, a range of 3-7 "kinds."³⁵

(4) Most authors recognize six families of game bird, but Romer³⁶ recognizes only four

and hybridization data³⁷ would suggest that even this is too many. Possibly only two kinds (the two superfamilies)—or even one—need be considered. The Phasianidae comprises two subfamilies so the range is 1-7 “kinds.”

(5) The duck family (Anatidae) contains three subfamilies giving a range of 1-3 “kinds.”

(6) Romer³⁸ lists 48 families of Passeres (song birds). Of these about 30 would be clean. But whereas the clean mammals have possibly been excessively “lumped,” the clean birds have suffered the opposite fate.³⁹ A range of 15-35 “kinds” seems fair.

Thus the total number of clean kinds will fall between 24 and 66 and the unclean between 604 and 734. At one pair for each unclean kind and seven pairs for each clean kind this gives extreme estimates of 1,544 and 2,392 for the number of animals taken into the Ark. Of these two numbers the lower is doubtless nearer the truth than the higher. It need hardly be emphasized that even the liberal estimate is far lower than any of the calculations given by those who argue either for or against the universal flood position.

The Size of the Ark

The proposal that the Ark was basically for only 8 people and 2,000 animals is rather startling and of course invites the response, “Why, then, was the Ark so large?” Morris⁴⁰ notes that the Ark had a volumetric capacity equal to that of 522 standard railroad stock cars. This number of cars could carry over 100,000 animals of the size of sheep. Evidently there is some discrepancy!

I share with Dr. Morris the belief that the Ark would have been perfect for its task, but I have long been unhappy about this particular argument. In the nature of the case, discussion of these matters must be somewhat speculative; the Bible simply doesn't give us the details we desire. Nevertheless we have, I believe, sufficient grounds for concluding that, large as the Ark was, it was not too large for only 2,000 animals.

In brief, the Ark was not designed for short-term *transport*, but for longer-term (one year) *living*. It was designed to preserve a world of living creatures through a cataclysm; thus:

(1) The extensive subdividing and bulk-heading of the floors and nests,⁴¹ the ramps for exit from the Ark and for access from floor to floor and the gangways to the nests (Gen. 6:14-16) would significantly reduce the space available for animals.

(2) Since the Ark had to be completely watertight (Gen. 6:14), there also had to be sufficient internal free space to prevent unbearable fouling or heating of the air.⁴²

(3) Living space for four couples (Noah and his three sons and their wives) for a year would have been substantial.

(4) Noah was instructed to take onto the Ark, “all food that may be eaten and gather it together unto thee that it may be to thee and to them (the animals) for eating.” (Gen. 6:21). Even though periodic hibernation (see below) would reduce the amount of food needed, the volume occupied would still be considerable, especially since the food would be largely, if not entirely, vegetable. The food may well have filled more space than the animals. Provision for water storage would also be needed.

(5) Space for the collection and temporary storage of excreta would be needed.

(6) The animals were to live on the Ark for a *year*. Must we consign the animals to cramped conditions for this length of time? Sufficient space for exercise and simply living would be required so that the characteristic behavior of each kind would not be stifled.

(7) During the year on the Ark, many of the animals would have reproduced and thus would have created further demands for space (although food storage areas will have become available during the year).⁴³

6. Gathering the Animals

An answer to the question regarding the gathering of the animals is very straightforward. It probably was impossible to gather representatives of every kind, because Noah was not told to do this. The Lord commanded Noah to “cause (the animals) to come *into the Ark*” (Gen. 6:19) and to “take to you (*into the Ark*—Gen. 7:1)” all the *behemah* and birds (Gen. 7:2-3), but he was told that they would come to him for this purpose:⁴⁴

(a) Gen. 6:20—“pairs of all *shall come unto you*”

(b) Gen. 7:9—“two by two *they came unto Noah*”

(c) Gen. 7:15—“*they came unto Noah* unto the Ark two by two”

(d) Gen. 7:16—“*the coming ones came* male and female of all flesh.”

“Consequently, all thoughts about elaborate trapping expeditions may readily be dismissed.”⁴⁵

7. Caring for the Animals

7.1 Preliminary considerations

Whitcomb and Morris calculated that “at the outside, there was need for no more than 35,000 individual vertebrate animals on the Ark.”⁴⁶ Filby, a proponent of the local Flood theory, compares this with the fact that there are only 720 minutes in a 12 hour working day, i.e. each member of Noah's family would have to see to six animals every minute.

According to the figure of 2,000 animals used in this paper, the burden is reduced to about one animal every three minutes, but this type of calculation is really quite meaningless. If some university or zoo staff members were to so meditate on the number of animals in their charge, they would soon look for another job! Noah and his family would certainly have a lot to do, but it does not take that long to look after animals.⁴⁷

7.2 Hibernation

In common with many others, Whitcomb and Morris suggest that the animals may have hibernated on the Ark, thus obviating the need for extensive care.⁴⁸ To this Filby replies that Noah was commanded to take of all food that is eaten "for thee and for them" (Gen. 6:21): "one doesn't feed hibernating animals."⁴⁹ However this is beside the point.

No one is suggesting (I hope) that the animals slept throughout the Flood year, but simply that they would have slept during the worst periods. Faced with the conditions on the Ark (falling temperature; reduced light; restriction on movement, etc.), the natural reaction of many animals would be to go to sleep.⁵⁰ Hibernation, in the strict sense, is only a small part of a wide spectrum of animal behavior.

In the tropics many small animals go to sleep to avoid the peak of the dry season—a phenomenon distinguished as *aestivation* although physio-

logically it is probably the same as hibernation.⁵¹ Even an occasional short period of unfavorable conditions will prompt many animals to sleep through it; and larger animals, such as bears, will remain in a semi-dormant state in their dens for months during the winter.⁵²

When hibernating, animals do not remain in that condition indefinitely, but arouse periodically in a rhythmic manner every few days or weeks.⁵³ As soon as conditions on the Ark improved the animals probably awoke and ate. The ability to enter into prolonged "sleep" is probably a common property of animals. That property was originally intended very possibly to meet the need for a period of rest.⁵⁴

8. Speciation

An answer to the final item of the criticism must be deferred to following articles in this series, since a detailed scientific analysis of the "kind" is required. Suffice it to say that speciation can indeed be very rapid for the simple reason that it is not an *evolutionary* process.

9. Conclusion

The biological criticisms of *The Genesis Flood* which center around the number of animals on the Ark have been examined and found wanting. The number of animals under Noah's care probably did not exceed 2,000.

References and Notes

¹Whitcomb, J. C. and H. M. Morris. 1961. *The Genesis Flood*. Presbyterian and Reformed Publishing Co., Philadelphia. Criticisms have been put forward in the *Christian Graduate* 22, p. 27 (1969) and *The Witness*, November 1970, p. 429 and *Faith and Thought*, 98 (2-3):61-68, 1972. See also issues of the *Journal of the American Scientific Affiliation*, U.S.A.

²Jones, A. J. 1972. Studies on the Biblical "Kind." A general analysis of min (kind), *Creation Research Society*, 9(1):53-57. June.

³Inclusion of amphibians must be left an open question, although many forms would clearly be excluded. Frogs (*tsephardea* Ex. 8:2-13; Psa. 78:45; Psa. 105:30) are almost certainly classed as water swimmers. See note 8 below.

⁴Genesis 7:14. Note that the terms are identical to those used in Genesis 1. The attempt which is often made to restrict the cargo of the Ark to domestic animals would require that only domestic animals are mentioned in the account of creation!

⁵This verse is generally interpreted as if the phrase meant "every sort of bird and every sort of winged creature" (e.g. by Calvin, Delitzsch and Leupold), but this would require a copulative *waw* ("and") before *kol kanaph*. The phrase strictly and only means "every sort of bird" (Spurrell, Cassuto). The phrase occurs again in Ezekiel 17:23; and 39:4, 17 where its meaning is beyond doubt. Similar constructions are found in 2 Chronicles 32:15, "no god of any nation" (*kol 'Eloah kol goy*), and Ezekiel 44:30, "all first fruits of all kinds" (*kol bikkure kol*), "all offerings of all kinds" (*kol teremath kol*).

⁶Dent. 4:17; Psa. 148:10.

⁷Forms which spend their whole life in the water are classed as water swimmers, e.g. ichthyosaurs, whales.

⁸I think particularly of the earthworm-like caecilians (*Caeciliidae*).

⁹The possibility must be borne in mind that the categories "clean for food" and "clean for sacrifice" may not be co-extensive, i.e. the latter may be wider than the former.

¹⁰Martin, W. J. 1955. *Stylistic criteria and the analysis of the Pentateuch*. Tyndale Press, London, p. 16; and Kitchen, K. A. 1966. *Ancient Orient and Old Testament*. Tyndale Press, London, p. 120.

¹¹Of 42 commentators I have checked, 23 argued for "seven pairs" and 19 for "seven."

¹²Whitcomb and Morris. *Op. cit.*, p. 65.

¹³Repetitions with a connecting *waw* are also found: 2 Sam. 21:20; 1 Chron. 20:6 and Zec. 4:2. Repetition also serves other functions, e.g., "two *by* two" (Gen. 7:8-9, 15), "day *by* day" (Gen. 39:10).

¹⁴A connecting *waw* is often found: Ezk. 40:10, 12; and 41:1.

¹⁵Also Num. 13:2; Jos. 3:12; and 4:2, 4; and 22:14.

¹⁶"each and every"—an attempt to represent in the English translation the emphasis created by the combination of *kol*, "all," with a distributive repetition.

¹⁷The term *'ish* or *'adham* with *'ishto* is elsewhere only used of mankind and always denotes a married couple (Gen. 2:25; Num. 5:15; and 30:16; Jdg. 21:21, 22; Jer 3:1). Contrast Isa. 34:15-16 where *re'uth* "fellow" is used of animals.

¹⁸since the text has here *the male and his mate*, the expression is repeated in the second half of the verse, in order to preserve the parallelism, and to make it clear that the clean and unclean animals differed only

- in regard to the *number*—not the principle—of (mated) pairs. In verse 3, after the signification of the numerical idiom *seven seven* had been established, it was possible to revert to the use of the normal formula male and female." (Cassuto, U. 1964. A commentary on the book of Genesis. Part II From Noah to Abraham. The Magnes Press, Jerusalem, p. 74.)
- ¹⁹For the distributive use of *'ish* see Genesis 11:3, 7; 9:5; 10:5; 40:5; etc. For this usage with *'ish* to see Judges 21:21-22.
- ²⁰Spurrell, G. J. 1896. Notes on the text of the book of Genesis. Second Edition. Clarendon Press, Oxford, p. 80.
- ²¹If Noah sacrificed one animal for each member of his family (cf. Job 1:15) then three pairs would be left. This is highly unlikely but serves to show the inconclusiveness of this type of argument. Many of the animals will have reproduced during the Flood year so it is probable that young forms were sacrificed and not breeding adults.
- ²²A comparison of extinction ratios for clean and unclean *behemah* illustrates this point extremely well. See section 5.1 for Tables Two and Three.
- ²³Jones, A. J. 1972. Boundaries of the Min: An analysis of the Mosaic lists of clean and unclean animals, *Creation Research Society Quarterly*, 9(2):114-123.
- ²⁴Romer, A. S. 1966. Vertebrate paleontology. Third Edition. The University of Chicago Press, Chicago, pp. 362-396.
- ²⁵Van Tyne, J. and A. J. Berger. 1959. Fundamentals of ornithology. John Wiley and Sons, Inc., New York, pp. 368, 376.
- ²⁶Thomson, A. L. (Editor). 1964. A new dictionary of birds. Thomas Nelson and Sons Ltd., London.
- ²⁷Simpson, G. G. 1945. The principles of classification and a classification of mammals, *Bulletin of the American Museum of Natural History*, 85:152.
- ²⁸Ellerman, J. R. and T. C. S. Morrison-Scott. 1966. Checklist of Palaearctic and Indian mammals, 1758-1946. Second Edition. Trustees of the British Museum, London, p. 377.
- ²⁹Simpson, G. G., *Op. cit.*, p. 270.
- ³⁰Gray, J. E. 1872. Catalogue of the ruminant Mammalia (Pecora, Linnaeus) in the British Museum. Trustees of the British Museum, London.
- ³¹E.g. Lammerts, W. E. 1966. The Galapagos Island finches, *Creation Research Society Quarterly*, 3(1): 73-79.
- ³²Based on Romer's data for the Hyracoidea, Perissodactyla, Artiodactyla and Lagomorpha.
- ³³I suspect that the figures for the evolutionist's "Pleistocene" give a truer picture of the situation immediately after the Flood.
- ³⁴For convenience I have taken all the mammalian figures from Simpson (*Op. cit.*, 1945) as modified by Romer (*Op. cit.*). However I dissent from the figure for the Cervidae. The peculiar antler-less musk deer (*Moschinae: Moschus*) is almost certainly unclean and belongs either to a separate family, Moschidae (Garrod, A. H. 1877.) *Proceedings of the Zoological Society of London*, pp. 287-292; and Pocock, R. I. 1910. *Ibid.*, pp. 937-939) or, as Romer suggests (*Op. cit.*, p. 287), to the otherwise extinct Palaeomerycidae. The Chinese water deer (*Hydropotes*—included in the Odocoileinae) is also possibly an unrelated form.
- ³⁵Figures for the bird families are taken from Thomson, *Op. cit.*
- ³⁶Romer, A. S. *Op. cit.*, pp. 375-376.
- ³⁷Gray, A. P. 1958. Bird hybrids. A check-list with bibliography. Commonwealth Agricultural Bureaux, Farnham, pp. 77-119.
- ³⁸Romer, A. S. *Op. cit.*, pp. 378-379. The figure for clean families includes all those whose members are primarily herbivorous/insectivorous.
- ³⁹The family Muscipidae (Flycatchers) includes forms which have been placed, at various times, in some 25 families!
- ⁴⁰Whitcomb, J. C. and H. M. Morris. *Op. cit.*, p. 67. Also *Creation Research Society Quarterly*, 8(2):142 (1971) where Morris gives a larger figure.
- ⁴¹The force of the accusative plural "nests" in Gen. 6:14 is "make it (all) nests."
- ⁴²The only window space in the Ark ran along under the roof (Gen. 6:16).
- ⁴³In the detailed description of the disembarkation, it is not said that the animals left the Ark in pairs (as is said of the embarkation in Gen. 7:9, 15), but simply that they left according to their kinds. The description in regard to Noah and his family is the same in both cases (Gen. 6:7, 13 and 8:18).
- ⁴⁴Lcupold, H. C. 1942. Exposition of Genesis. (1968 printing). Baker Book House, Grand Rapids. Volume I, pp. 276-277, 299.
- ⁴⁵Leupold, *Ibid.*, p. 277.
- ⁴⁶Whitcomb, J. C. and H. M. Morris. *Op. cit.*, p. 69.
- ⁴⁷I speak from experience. I have had to look after some 30 tanks containing several hundred fish in breeding condition. These all had to be cared for every day!
- ⁴⁸Whitcomb, J. C. and H. M. Morris, *Op. cit.*, p. 71.
- ⁴⁹Filby, F. A. 1970. The Genesis Flood (letter to the editor), *The Witness*, p. 429. Cf. Filby, F. A. 1970. The Flood reconsidered. Pickering and Inglis Ltd., London, p. 85. (Also available from Zondervan Publishing House, Grand Rapids, Mich. 49506.)
- ⁵⁰See articles in Mammalian Hibernation III (K. C. Fisher *et al.*, editors) Oliver and Boyd, Edinburgh and London. 1967.
- ⁵¹See Pengelley, E. T. 1967. The relation of external conditions to the onset and termination of hibernation and estivation (*in*) Mammalian Hibernation III. *Ibid.*, pp. 1-29.
- ⁵²See Folk, G. E. 1967. Physiological observations of subarctic bears under winter den conditions (*in*) Mammalian Hibernation III. *Ibid.*, pp. 75-85.
- ⁵³Pengelley, E. T. *Op. cit.*
- ⁵⁴That hibernation satisfies a need for rest was suggested by Walter Heape in Emigration, migration and nomadism. Edited by F. H. A. Marshall. W. Heffer and Sons Ltd., Cambridge, chapter IX, pp. 304-320. 1931. (This suggestion should be followed up. Was there, for instance, an animal equivalent of the one day of rest in seven established for man?)

DISCOVERY OF HUMAN SKELETONS IN CRETACEOUS FORMATION

CLIFFORD L. BURDICK*

When checking over a pit in the Dakota sandstone formation, Mr. Lin Ottinger, with the help of Dr. J. P. Marwitt, discovered skeletons of two human beings just below the level where bulldozers of the Big Indian copper mine had stopped digging. The formation is considered to be part of the Cretaceous formation and given an age of about 100,000,000 years by orthodox geological considerations.

Introduction

Moab, Utah is located in eastern Utah on the Colorado River, not far from the state line. The rock outcrops there are mostly Mesozoic, ranging from the lower Triassic, or Moenkopi, up through the Jurassic to the Cretaceous, with exposures of Dakota sandstone, Mancos shale, and the Mesa Verde. Some of these formations are well mineralized, with uranium, copper and associated minerals.

The Big Indian copper mine was located on the Cretaceous Dakota sandstone of the Lisbon Valley about 35 miles south of Moab, Utah. The strata there are poorly cemented, or possibly being in the oxidized zone are weathered. The top strata of the hill were discolored a dark brown from the iron in the formation, but the lower strata where the bones were found was of a natural sandy color, whitish.

The Ottinger Find

One side of the Dakota sandstone hill had been dug away by means of bulldozers, since the rock was soft enough for that type of excavation. Apparently the quality of the ore had decreased to the point where it did not pay to dig deeper, so the digging was stopped about 15 feet below the surface of the hill. The mine superintendent stated that at least six feet had become hard rock, though still soft enough to bulldoze.

Mr. Lin Ottinger, a friend of the mine superintendent, and some Ohio visitors were given permission to dig for artifacts and azurite specimens. They soon found a tooth and bone fragments both obviously human, and Ottinger traced the bone fragments to their source, uncovering at least one whole skeleton. Without further disturbing the find, he then notified Dr. W. Lee Stokes, head of the geology department of the University of Utah, who sent Dr. J. P. Marwitt, anthropologist, to investigate.

With the cooperation of the mine officials, Dr. Marwitt and Lin Ottinger carefully removed the sandstone surrounding the bones, and discovered two human skeletons rather than one. Meanwhile volunteers were screening the loose sand near the site to recover small pieces such as teeth and finger and toe digits.

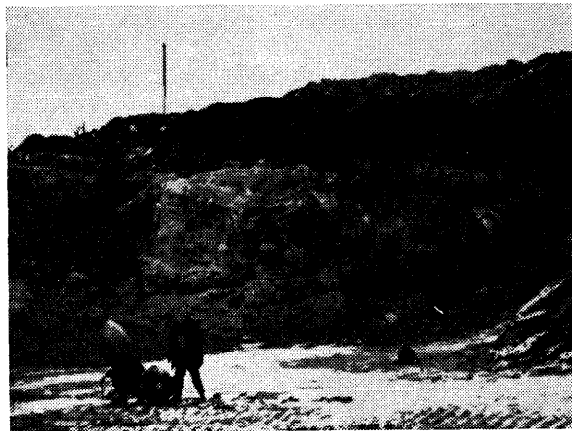


Figure 1. The mining company pit where human skeletons were found south of Moab, Utah, in Cretaceous rock, Dakota sandstone containing oxidized copper minerals.

Because the bones were: (1) in place where buried and undisturbed, (2) still articulated or joined together naturally, indicative of no pronounced earth movement, and (3) green from copper carbonate solution (of malachite), Dr. Marwitt considered them "highly interesting and unusual." He had unearthed many Indian and other skeletons but never had found one so stained by the surrounding minerals.

Although definitely *Homo sapiens*, this staining gave a suggestion of antiquity to the find. The homogeneous character of the enclosing rock appeared to rule out the possibility of prospectors being buried by a cave in.

Dr. Marwitt moved the skeletons to his laboratory for further study, but later returned them to Mr. Ottinger, not appearing to have much interest in them for a museum display. Could it be that their association with the Cretaceous rock, presumed to be very old, could be the reason? In any event this discovery is reported for what it may be worth.

(Editor's Note: Admittedly this discovery offers as much of a problem for Flood geologists as for those of the orthodox point of view. For it is difficult to explain how two men could still be alive after such a depth of strata had been deposited. And if already drowned, why were they not buried later in the Mesa Verde formation? A more detailed and clear cut concept of just how the Flood accomplished its work is

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badly needed in order to be able to see how such finds as these fit into theoretical expectations, or creationists will be guilty of the same ad hoc explanations as evolutionary minded colleagues. —W. E. Lammerts, Research Editor)

Conclusions

(1) The bones were definitely "in place." There was no evidence of the surrounding rock having been disturbed, as I dug a foot deep at the site.

(2) The skeleton was pronounced by the University of Utah as definitely *Homo sapiens*.

(3) The deep staining of the bones with malachite attest to their age.

(4) It was evident from the location of the find deep within the man-made pit that the bodies were buried at the time of the emplacement of the sandstone rock.

(5) The type of mineral alteration suggests greater age than 100 years as suggested by the mine superintendent. Black bits of chalcocite, a primary type of copper ore, are still in place. Chemical alteration changes this to blue azurite or green malachite, both carbonate minerals

formed in the near surface or oxidized areas of the earth's crust. This diagenesis takes time.

(6) If this were one isolated instance of such an anomaly, one might be tempted to disregard it completely; however, other similar so called anomalous discoveries have recently come to light involving fossil remains of recently extinct mammals, even human beings, in Cretaceous rocks. Another such find has been made recently by this writer, which may soon be published.

(7) These and other evidences seem to suggest that much of the geologic column has been "built" on too meager and perhaps even a "flimsy" foundation. One solution would seem to be reduction of some of the time element associated with the geologic column.

Added Note

The University of Arizona personnel performed the Micro K Jeli Dahl or nitrogen retention test on the bones, and found them comparatively recent in origin, that is well within Biblical time limits. The result cannot be interpreted accurately in terms of years.

—Clifford L. Burdick.

RETRIEVAL SYSTEM PROBLEMS WITH ARTICLES IN "EVOLUTION"

JOHN N. MOORE**

Introduction

Paleontologists and paleobotanists have been reconstructing evolutionary changes for many decades. Likewise, scientists in the fields of genetics, zoogeography, and numerous other fields have been studying some degree of evolutionary change for many years.

Encouragement for such studies has come especially from the Society for the Study of Evolution and the journal, *Evolution*, which has been devoted to evolutionary research ever since it was established in 1947. And because an interest in the study of evolution is the only condition for membership in the Society for the Study of Evolution, even a classroom professor may be encouraged to be a student of some kind of evolutionary change.

Though a new member of the Society for the Study of Evolution, for more than 15 years, I have been gathering xerox copies of statements by scientists on organic evolution and natural

selection and related topics; and am preparing an anthology of such statements. I have given many speeches on my findings before science teacher groups and science classes at both the high school and college levels. And I have consulted and corresponded extensively with scientists in Canada, England, Europe as well as the United States. For the last 10 years I have taken a critical stance on "evolution."

As my written critiques have become known, honor students and others interested in independent study have come to me for assistance in their study of the literature on evolutionary change. They have sought guidance in their readings about the various "schools" of evolutionists that can be examined today from a historical perspective that covers the 111 years plus since publication of Charles Darwin's, *The Origin of Species*.

Just this year an interesting experience has given me a new insight into some of the literature published under titles containing the term "evolution." Bright young students aware of the possibilities of using computer techniques as aids to research have shown an interest in preparing programming for retrieval systems for "recall" of articles and books in the area of evolutionary literature. This paper is designed to give attention to results of an initial investigation of pos-

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sible use of retrieval systems for storage of references to journal articles.

Two Retrieval System Approaches

Concepts from program systems, computer analysis and retrieval systems learned by information theory students can be applied to handling the mounting volume of scientific publications. A project on storage of article titles for the journal, *Scientific American*, completed earlier this year by a departmental colleague, has been very beneficial in increasing classroom use of reprints of such articles and stimulating more reading by students interested in extra-class study of special topics (Donald Weinshank, *Department of Natural Science Literature Retrieval System*, January, 1971).

Two main approaches can be taken in preparing cards for final print out forms. One process is called Key Words in Context, and designated by the acronym, KWIC. A common form resulting from this approach is an alphabetical listing of complete titles from a journal over a certain period of publication with some key word in the titles fully capitalized, for example:

— P —
The Allopatric Model and PHYLOGENY in Paleozoic Invertebrates
Unorthodoxies in Reptilian PHYLOGENY
A Biometric Analysis of POPULATIONS of *Poa annua*

Another process involves Key Words out of Context, and designated by the acronym, KWOC. A common form resulting from this approach is an alphabetical listing of terms under which complete titles of journal articles containing the given word appear in separate alphabetical order, for example:

EVOLUTION
Evolution in Constant and Fluctuating Environments
Evolution of Food-Plant Preference in the Butterfly *Euphydryx editha*
Evolution in the House Sparrow
Evolutionary Relationships in the Outcrossing Diploid Annual Species of *Stephanomeria* (Compositae)
The Evolution of Reproductive Isolation in *Clarkia*, Section *Myxocarpa*

One type of independent study project under my direction was designed to concentrate upon consideration of articles in the Society for the Study of Evolution journal, *Evolution*. As mentioned, this is a primary journal for publication of articles dealing with studies of evolutionary change (actually *microevolutionary* change as will be shown later). A special appropriateness for application of the KWIC or KWOC approaches to preparation of articles of the journal, *Evolution*, for retrieval storage seemed to be gained, at this time, from the fact that 1971 is the twenty-fifth year of publication of that journal.

Results of KWOC Approach

The KWOC approach to organizing articles for retrieval system recall was chosen for special attention. One person involved in the independent student project expressed the opinion that

Table 1. Frequency of "evolution," "evolutionary" in article titles per issue of *Evolution*, Vol. 1 thru Vol. 25, No. 2.

	No. 1	No. 2	No. 3	No. 4	Totals	Total No. articles in issue	
Vol. 1, '47	—	3	—	3	1	7	22
Vol. 2, '48	2	2	2	2	2	8	27
Vol. 3, '49	2	5	1	5	13	43	
Vol. 4, '50	3	2	1	2	8	40	
Vol. 5, '51	2	4	1	8	15	50	
Vol. 6, '52	2	3	0	1	6	32*	
Vol. 7, '53	4	1	0	1	6	27	
Vol. 8, '54	3	1	0	3	7	31	
Vol. 9, '55	3	2	2	0	7	35	
Vol. 10, '56	2	3	2	1	8	36	
Vol. 11, '57	2	2	1	4	9	39	
Vol. 12, '58	1	6	3	1	11	43	
Vol. 13, '59	2	4	3	2	11	38	
Vol. 14, '60	1	3	2	7	13	43	
Vol. 15, '61	—	—	**	—	9	53	
Vol. 16, '62	—	—	**	—	11	44	
Vol. 17, '63	—	—	**	—	9	59	
Vol. 18, '64	—	—	**	—	17	76	
Vol. 19, '65	2	2	1	1	6	51	
Vol. 20, '66	0	2	3	3	8	48	
Vol. 21, '67	3	5	3	4	15	71	
				Sub-totals	204	908	
Vol. 22, '68	4	2	2	6	14	69	
Vol. 23, '69	4	2	3	3	12	57	
Vol. 24, '70	3	1	2	2	8	69	
Vol. 25, '71	1	4	—	—	(5)	(40)	
				Grand totals	243	1143	

*Notes and Comments section began with this issue.

**Library binding prevented rapid determination by separate quarterly issue.

all article titles, or at least a great majority, published in the journal, *Evolution*, would contain the term "evolution," and consequently no adequate separation of articles would result. To gain a test of small scope of this opinion, photocopies of cover content listings of articles were obtained for the issues of Volume 25 (March and June, 1971) and for the previous three years through Volume 22, 1968.

Contrary to expectation the term "evolution" was used only in a small percentage of the titles involved. As indicated in Table 1, none of the quarterly issues contained more than six article titles with the term "evolution" included. In fact one issue, March, 1966, contained *no* article title with the term "evolution" included. Further, the most common number of article titles containing the word "evolution" was either 2 or 3 per issue.

Stimulated by this initial analysis, a more thorough check of article titles was made through the entire published volumes of the journal, *Evolution*. Complete data contained in Table 1 are useful in reaching the following generalizations:

1. Of the total of 1143 articles published, *less than* one-fifth of the article titles, or *less than* 20%, contained the term "evolution."

2. A possible "reducing trend" in the last few years might be identified on the basis that the total of 204 out of 908 in Volume 1 through Volume 21 contained a higher percentage of article titles including the term "evolution." Of all the articles in the first 21 volumes, at least one-third, or about 33%, of the article titles contained the term "evolution."

3. As the total number of articles per quarterly issue increased there was no increase in article titles containing the word "evolution."

4. All other key words contained in article titles can be related to species changes, or genera considerations, and *not* to major evolutionary changes of some phylogenetic nature.

With regard to the last generalization, article titles did actually contain many, many terms that could be related properly to limited variation *within* limits of recognizable plant and/or animal type, form, or kind. Table 2 contains specific itemization of data that may be used as basis for this assertion. Such terms as the following were used over and over again:

adaptive radiation	introgression
differentiation	natural selection
diversification	speciation
genetic variability	species interaction
hybridization	variation

At this stage of the research effort by independent study students, a contradiction became evident. Explicitly, the journal, *Evolution*, contains articles that deal *more with* "variation" within limits of plant or animal type, form, or kind *than with* major evolutionary changes of phylogenetic nature. Analysis of article after article resulted in the following conclusion: researchers terminated their field or laboratory studies with essentially the same type, form, or kind of organism as that with which they had begun their study—regardless of the time duration involved in the work reported in a given article.

Recognizing a need for rigorous definition of terms, much effort was given to development of a type of glossary, as follows:

(a) **Evolution:** not simply change, or change of gene frequency, but broad, major changes of the degree involved if changes from amoeba to man, or molecules to man, had occurred (such as amphibia coming from fish, reptiles from amphibia).

(b) **microevolution:** limited changes involving mechanisms at the species level and even below that are verifiable by controlled experiments directly. (Also referred to in the literature as "special" evolution, and more recently "infraspecies" evolution.)

Table 2. Key Words Out of Context, other than "evolution," "evolutionary" in article titles in *Evolution*, Vol. 1 thru Vol. 25, No. 2.

— A —		
acquired character	cell differentiation	cytogenic study
adaptive radiation	canalization	cytogenetics
adaptive range	catastrophic selection	cytotaxonomic
adaptation	cellular antigens	cytoplasmic pollen sterility
adaptive value	character analysis	cytoplasmic "sex ratio"
adaptive responses	character combinations	— D —
adaptive shift	chemical patterns	Darwin finches
allochronic speciation	chiasma frequencies	Darwinian selection
allometric relationships	chiasma localization	dental characters
allopatric populations	chromosomes	developmental homeostasis
allopatric species	chromosomal aberrations	developmental rate
altitudinal transect	chromosome number	derivation
altitudinal races	chromosomal arrangements	diapause
amphiploidy	chromosomal distribution	differentiation
ancestry	chromosomal races	differential selection
aneuploid origin	climatic races	diploid species
atypical forms	cold resistance	diploid potatoes
autopolyploidy	color alleles	dimorphism
— B —	color patterns	dispersal
balanced breeding	color variant	disruptive selection
bacteriophage	comments	distribution
Baldwin effect	comparative analysis	distribution pattern
bat distribution	comparative physiology	divergence
biological status	competition	diversity
biological studies	competitive exclusion	division of labor
biosystematic studies	compilospices	— E —
body proportions	complex	ecoclimatic divergence
blood groups	convergent trends	ecological genetics
body sizes	courtship	ecological diversification
brains	cowbird parasitism	ecospecies
— C —	cranial kinesis	ecotypic differentiation
caenogenetic differentiation	crossing experiments	ecotypic variation
	cyclic hybridization	egg size

Table 2. (Continued)

environmental selection	interspecific	pigment variations
epistatic gene complexes	intraspecific competition	plant competition
equilibrium theory	intergenetic hybrid	pleiotropic
experimental populations	introduced population	plasmagenes
experimental studies	introgression	polymorphism
extinction	insemination	polyploidy
— F —	invasions	pollination relations
family size	inversions	polygenes
feeding adaptations	island populations	populations
fertility	isolating mechanisms	population biology
fitness	isolation	populations density
fire melanism	isolating factor	population dynamics
fixation of mutant	isoallelic competition	populations genetics
floral constancy	— K —	population size
food-plant specialization	karyotype differentiation	Porcupine relationships
food preferences	karyotypes	post-stinging behavior
formen ovule	— L —	pre mating isolation
flower odor	laboratory populations	protection
flower dimorphism	lampreys	protein variation
fluctuating asymmetry	linkage	— Q —
foliar-gland loci	larval color patterns	quantitative approach
frequency changes	latitudinal variations	quasi-mammals
frequency-dependent selection	lethal factors	— R —
— G —	local populations	rabbit
genera	lagomorph relationships	races
genetics	lycid predation	radiosensitivity
genetic assimilation	— M —	recombination
gene exchange	macrogyna	regional melanism
gene frequency	masterometry	reproductive mechanism
gene replacement	mating	relative fitness
gene frequency shift	mate preference	reproductive isolation
gene substitution	mating behavior	respiratory organs
gene flow	mating interference	— S —
genetic drift	mating systems	saltations
genetic differentiation	marginal populations	seasonal variation
genetic population	mechanical isolation	selection
genetic structure	mimetic patterns	selection index
genetic variation	mimic assemblages	sexual isolation
geographic barriers	mimic patterns	sexual selection
geographic history	microgyna	sex difference
geographic differentiation	mimicry	sex determination
geographic populations	mimics	sibling species
geographic speciation	modern synthesis	space
geographic variation	morphological integration	species
geography	mutant	species hybrid
grades	mutation	speciation
group-predator behavior	— N —	specialization
— H —	natural coexistence	stability
habitats	natural hybrid	subspecies
herbivorous lizards	natural populations	subspecific
herpetogeography	natural selection	survival process
heterokaryotypes	natural triploids	sympatric species
heterploidy	neighborhood size	systematics
heterosis	niche differentiation	— T —
heterostyly	nutritional variables	tetrapod limb
historical zoogeography	— O —	tooth structure
histocompatibility genetics	“operational niches”	transartic relationships
homologies	origin	translocations
hybrids	osteometric variation	— V —
hybridization	outcrossing	varieties
hydrocoel	— P —	variation
— I —	parallelism	vascular plants
inbreeding	parthenogenesis	vocal variation
inbreeding systems	parathyroid gland secretions	— W —
infraspecific	phyletic	warning coloration
inheritance	phylogeny	wild populations
interbreeding	phylogenetic relationships	— Z —
interchange	physiological properties	zoogeography
interfertility		

(c) **macroevolution:** major changes supposedly involving appearance of new distinctive adaptive features or the origin of new taxa at the generic level and even higher (which is essentially the amoeba to man thesis). (Also referred to in the literature as "general" evolution, and more recently "transspecific" evolution.) Not observable directly.

(d) **variation:** genetic differences within a given population involving changes of homozygosity and heterozygosity within successive generations of the same type, form, or kind of organism.

(e) **mutation:** mistaken, erroneous duplication of some part of DNA complex in a cell. New modifications of known physical characters result but *no really new* character is known as a result of failures in proper, "normal" duplication.

(f) **type:** an original description based on diagnostic characters to fix the correct name of a definite individual. "Different forms of life were referred to as 'types' by the comparative anatomists of the last century and even earlier. Bats, whales, birds, penguins, snails, sea urchins, and all the other wellknown kinds of animals and plants are such types." Ernst Mayr, *Animal Species and Evolution* (1963), p. 588. Emphases added.)

At this stage I felt a definite challenge to analyze the research reports in the journal, *Evolution*, in much more detail than mere attention to article titles. After sheer scanning of the articles in a few issues I realized that authors had also used "coevolution," "evolutionary rate," "microevolutionary," "macroevolutionary." And often the article titles as well as exposition throughout an article contained reference to "phylogeny," "phyletic," and "phylogenetic" which could be taken more or less as synonyms for "evolution." But for purposes of simplicity of counting, only the frequency of the use of the term "evolution" was itemized.

I conducted a specific analysis of articles of Volume 25 (March and June, 1971) and quar-

terly issues of Volumes 24 through 22. Data analysis was divided in agreement with the "standard format" of articles per "introduction," "discussion," and "conclusion, summary." Data gained from close reading of such articles afford a basis for making predictions regarding articles in *all* volumes of the journal, *Evolution*. Results are recorded in Table 3 according to major sections of articles after the usual "format" employed by authors in the journal, *Evolution*.

Several conclusions are possible from Table 3. The average number of times that the word "evolution" was used was just a little over *one time* per article per issue. Of course, the infrequent use of the term "evolution" in the Conclusion, Summary sections could very well be expected because of the extreme brevity of sentence structure in that section. And the greatest frequency of the term "evolution" is found in the Discussion sections, which seems altogether what one would expect.

However, more extensive tabulation of data in Table 3 is provided in Table 4, and may be used as an adequate basis for generalizations regarding detailed analysis of the use of the term "evolution," as follows:

1. Regardless of the article section, a *one time* mention of the term "evolution" is most frequently recorded.

2. The highest frequency of usage of the term "evolution" in an article section was 24 times in a discussion section in quarterly issue No. 4, 1970.

3. Most often mention of the term "evolution" in the introduction or conclusion, summary sections was noted at the very beginning, or just at the end of the section.

Based upon the three and one-half year close analysis, a prediction that continued close analysis of articles in consecutive volumes on to the very first volume will result in corroboration of these generalizations seems most appropriate.

Table 3. Frequency of "evolution," "evolutionary" in article sections per issue of *Evolution*, Vol. 22 thru Vol. 25, No. 2.

	Vol. 22, 1968				Vol. 23, 1969				Vol. 24, 1970				Vol. 25, 1971			
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Article sections	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Introduction	9*	4	6	9*	8	4	7	7	8	7	6	6	11	9	—	—
Discussion	11*	7*	8	4	7*	7*	8*	7*	10*	9*	6*	9	13	9	—	—
Conclusion, summary	5	4*	6	6*	7*	4*	6*	6	5*	6	3	7	5	4	—	—
Totals	25	15	20	19	22	18	21	20	23	22	15	22	29	22	—	—
Total no. articles per issue	20	19	13	17	15	13	13	16	20	18	15	16	20	20	—	—

*Indication that one or two articles contained combined Discussion-Summary sections, or some other combination of sections, or no Discussion section or Summary, or no Introduction section as such were included in the article.

Table 4. Itemized frequency of “evolution,” “evolutionary” in context in article sections per issue of *Evolution*, Vol. 22 thru Vol. 25, No. 2.

[illegible]

Discussion

Does the alert, bright, independently thinking student have a basis for asking about a "credibility gap" in the publication sector of scientific endeavor? Or, is there an intellectual corollary to the much publicized "generation gap"? If there is a demand for "truth" in advertising, is there a parallel reason to demand that science writers practice a "truth" in their writing? If the journal, *Evolution*, does not contain articles written explicitly about evolution, then what are the writers communicating?

Before the articles of the journal, *Evolution*, could be used in the classroom, and so as not to be heavily criticized by bright, alert, independently thinking students, much explanation would be required as to how students should look properly at the research results and conclusions and summary statements of writers.

If writers of articles in the journal, *Evolution*, deal primarily with variation of plants or animals *within* type, form, or kind almost to the exclusion of exposition on "evolution," as is shown indirectly by the extensive itemization of key words *other than* "evolution" listed in Table 2, then students must be told that such a source of first-hand research reporting bears most properly upon analysis and study of variations, hybrids, species, genera, natural selection, introgression, diversification—and all *within* limits of recognizable types, according to the meaning contained in the quotation from Ernst Mayr. In a word, articles in the journal, *Evolution*, do *not* deal with "evolution," according to the definition given above.

Students in preparatory stages of major study in the biological or life sciences must be alerted to the fact that the published quarterly issues of the journal, *Evolution*, cannot, and I repeat cannot, be used as a source for extensive discourse on major evolutionary change involving cross phyla lines, or what might adequately be termed transmutational changes.

One specific article in the December, 1970 quarterly issue (Volume 24, No. 4) is an excellent case in point. It is entitled, "Microevolutionary Sequences as a Fundamental Concept in Macroevolutionary Models" and the author purports to be presenting a discussion of support of the "synthetic assumption" that the microevolution and macroevolution continuum is correct. This is the article with the highest frequency of the use of the term "evolution" as itemized in Table 4.

But this article contains *no empirical* research in the way of demonstrating any definite *genetic* connections between different species, let alone between or across any major phylogenetic lines. Page after page of the article is full of such words as "assumed," "believed," "claimed," "be-

lief," "idea," and "suggested." The author's subject matter is *not* that of evolution of major dimensions but *only* of variational changes *within* genera and species of birds.

His definition of macroevolutionary change is totally unacceptable if avoidance of equivocation of terms is desired, which seems to be preferred in the highest level intellectual endeavors. And the same kind of critical remarks may be lodged against a major reference report cited by this author as in *Systematic Zoology*, 14 (4), December, 1965, which was constituted as a symposium on the so-called origin of higher levels of organization.

That these published articles in the journal, *Evolution*, center on topics other than major evolutionary changes is evident in such other examples, as follows:

a. In Volume 25, No. 2, the Michael Singer article clearly deals with "microevolution," and the Brown-Feldmeth co-authored article contains reference regularly to "natural selection."

b. In Volume 25, No. 1, mention is made in the Jameson-Pequinat article to the "general theory of natural selection," on pp. 180, 190, and 191, and to the "process of natural selection" on p. 211.

c. In Volume 24, No. 3, in referring to "evolution," Bartholomew mentioned the "highly inferential tradition." Examples of the speculative style of writing and use of extended reasoning patterns wherein writers discuss "evolution" could be multiplied many fold.

What is the credibility of publishing articles in a journal entitled, *Evolution*, if bright, alert, independently thinking students find such examples as these? Only rigorous definition of terminology will prevent embarrassment of research specialists and professors alike, who write and teach about "evolution" when their written expressions are reviewed and studied closely by bright, free thinking students. Evolution cannot in any way be adequately thought of as the same as variation.

Nor will careful intellectual endeavor be served by any possible confusion between the theory of organic evolution and the theory of natural selection. If organic evolution is the rubric under which the concepts of major changes of one animal type into another (or one plant type into another) as the "end" of mutational and variational combinational change, *then* those mutational and variational combinational changes are exclusively the "means" whereby supposedly the "ends" of major evolutionary change occur. In highest level intellectual endeavor no confusion of terms, no equivocation of terms can be allowed. Means are not ends, and ends are not means.

The voluminous collection of articles in the journal, *Evolution*, is evidence in hand that ac-

tual research work is designed to bring forth information about variation and *microevolutionary* changes *within* limits of known types, forms, or kinds of plants or animals.

Conclusions

Of the two approaches to preparation of cards for final print forms for retrieval systems for ready recall of journal articles, the KWOC analysis method may be used to show vividly that the journal, *Evolution*, contains articles which are predominantly *not* about "evolution."

Based on the content of Table 2, the KWOC approach may be used to show vividly that key words in article titles of the journal, *Evolution*, involve concepts that are properly related to study of consequences of the theory of natural selection, variational changes *within* recognizable limits of known types, forms, or kinds of organisms.

If it is proper to say that research work has been completed upon the concept of "evolution" at all, then clearly that research is directed empirically at microevolutionary change, but these changes are *no more than* variational changes, infraspecific changes—and *not at all the type of changes* involved in major evolutionary concepts which also have been called transspecific changes.

The *only* reason that writers have been writing for some twenty-five years that evolution has been observed or has been studied is because they have committed a base confusion of the theory of organic evolution and the theory of

natural selection. These are not interchangeable theories. The former relates to "ends" and the latter relates to "means." And means cannot be mixed with ends in sound intellectual endeavor.

Based upon these analyses for preparation of KWOC retrieval system material, as drawn from published articles in the journal, *Evolution*, from Volume 1 through Volume 25 in current issue, consideration of change of name of the journal under question is in order by officers, editors, associate editors, and councilors.

The journal, *Evolution*, should be renamed promptly to communicate more accurately the actual nature of the majority of published articles. The journal might well be re-named: *The Journal of Natural Selection*.

The suggested name change is actually in keeping with article emphases as admitted by writer after writer. Though almost singular mention of the word "evolution" may be found in basic article sections, reference is found regularly to natural selection, theory of natural selection, and multiple types of selection.

Certainly primarily singular mention of the word "evolution" will not convince bright, alert, free, and independently thinking students into accepting that the actual content of the journal, *Evolution*, is related to major evolutionary changes, to phylogenetic changes across phyla lines, or to transmutational changes—when specifically and empirically it can be shown that said articles center on natural selection and variational changes *within* limits of types.

COMMENTS ON SCIENTIFIC NEWS AND VIEWS

HAROLD ARMSTRONG*

Thermal Communication in Plants?

The way animals regulate their temperatures is one of the wonders of nature. It is, also, as has been noticed in these pages, one of the pieces of evidence against evolution; for it is one of those abilities which would have to be about perfect before it would be of any use at all.

Now it appears that certain plants, philodendrons, for instance, have a somewhat similar ability, under certain circumstances.¹ It is reported that *Philodendron selloum*, at certain times, maintains a core temperature of 38 to 46 degrees C, despite air temperatures all the way from 4 to 39 degrees C. The necessary metabolism is carried out in small sterile male flowers.

It is suggested that the heating helps to dif-

fuse the scent around², and to attract insects, which may fertilize the plant. Is there another, related, possibility?

There seems to be evidence that some insects have organs which can detect infra-red radiation, i.e., heat. Is it possible that the heating of the plant to warmer than the surroundings serves to attract insects because they can sense the plant—in other words, that the plants, or the special flowers, act as beacons?

Be that as it may, surely a feature such as this could not have evolved. For, again, it would have to be about perfect before it would be of any use at all. Incidentally, this feature is somewhat like the regulation of heat in many animals, as was mentioned. Is it possible that anyone will attempt to explain (or, rather, to dismiss), the presence of similar features in a plant and in an animal by calling it convergence?

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Coelacanth DNA Amazing

Ever since it was discovered, some years ago, that there are coelacanths still living, this odd fish has continued to furnish surprises. Studies of nuclear DNA have shown it to be anomalous, that is from the evolutionary viewpoint.²

It is reported that the DNA content of erythrocyte nuclei in the coelacanth, *Latimeria chalumnae* (one was caught alive and studied), is well above that of some amphibia, and in the same range as *Rana*. This, of course, was a surprise, for it was supposed that this fish was further down the scale of evolution, and moreover that the amount of DNA had increased as evolution proceeded.

The article authors write that the amount is "... higher than would be expected ..."; and offers the suggestion that "... increased cellular DNA contents have arisen many times independently ...". This, it would appear, is just the excuse of "convergence."

It need hardly be said that when proponents of a theory must plead convergence frequently, their scheme is not worthy of serious consideration as a scientific theory. What would anyone say of a theory of astronomy in which, every time a planet appeared in an orbit that did not follow Kepler's laws, the exception was shrugged off as a (let us say) divergence?

Biological Sonar

Anyone who has access to the French journal, *La Recherche*, might be interested in an article on the ability, which various animals have, of locating things by echos.³ The article is not at all creationistic; the author speaks of the ability as having evolved. Of course, there is no evidence at all that it did so. But the illustrations, and the data given, might be of some interest to anyone who is interested in the details of how animals use this method to find their way about.

Animal Abuse and Equipment Overspending

A recent newspaper report, on the basis, apparently, of information from the Animal Defence League of Canada and United Action for Animals, Inc., New York, contains the information that a great effort is being made to induce teachers of biology in high schools both in Canada and in the United States to do, or rather have their students do, more and more experiments on animals.⁴

It is said that those who are doing most of the urging are suppliers of animals and of related equipment, since they have a financial interest in a greater and greater use of animals. Some concern is expressed in the newspaper account, on the grounds that those who become accustomed to do cruel things, or things that seem cruel, to animals are less likely, other things

being equal, to be kindly in their other dealings with those around them.

As for the drive to sell more and more animals and equipment, I can believe that it exists from what I see in physics. There, as anyone who can read can see, teachers are being urged to buy senselessly elaborate and expensive equipment—so elaborate, in some cases, that the equipment gets in the way of the physical principles which it is supposed to illustrate. It would not be surprising if one should find that something similar is happening in other sciences.

Here, maybe, is a case in which Christians, and especially creationists, can give a silent testimony to their faith. As to our dealing with animals, Proverbs 12:10, to mention just one place, shows us what we should do.

Besides questions of cruelty or kindness, there is another matter. Those of us who are teachers, and purchase equipment, are, in effect in many cases, acting as custodians of public money. As Christians, we surely have a special responsibility to use that money wisely, and not to waste it. Creationists should make a special effort to keep "above board" in these matters, so that even those who do not agree with us may have to recognize our integrity.

"Protective Camouflage" and Animal Vision

The protective camouflages of insects and other creatures; the fact that some insects, in particular, may be poisonous, or at least very distasteful, to predators, because of materials which they either make themselves or get from their food; and the way in which some creatures evidently get some protection by looking like unwholesome ones, have all been mentioned from time to time in the *C.R.S. Quarterly*.

An article, in which some of these matters are discussed, has recently appeared in the *New Scientist*.⁵ The author does not take a creationistic view but rather considers that these features all evolved somehow. Yet, he does not show, just as it has never been shown and never will be, how such features could, in fact, have evolved.

The article, however, might be of interest for the sake of some of the examples which it gives. Also, one point, which is often overlooked, is discussed briefly. It concerns the insects (say), which are considered to get some protection by looking like unwholesome ones.

They look alike to us, or else we should not say that there is a resemblance. But do they look alike to possible predators? It is often supposed that other animals' vision of color is different from, or inferior to, ours.

The way in which looking at color differently, e.g. taking photographs through various filters, may affect what is seen and what is not is known

to everyone concerned with military camouflage. Thus, it is hard to know just how things look to other creatures, we must be careful in talking about resemblances.

Red Tide and Fossils

Even places, people, and publications which seem to be committed to a uniformitarian view find themselves admitting catastrophism every now and then. A recent writer, noting that there is much which uniformitarianism does not explain readily, suggests a catastrophe in the form of a "red tide" as a possible cause of certain formations containing fossils.⁶

By "red tide" is meant "... seawater discolored by the presence of a large number of dinoflagellates in a density which is fatal to many forms of marine life. . . ." Part of the notion is that, after such an event, there would be few bacteria present for some time; thus the dead creatures might last long enough to be buried.

Certainly such things could have happened. However, it seems unlikely that this would offer any general explanation. The dead creatures might last for some years, but scarcely for the centuries which would be necessary to bury them at uniformitarian rates. "Red tides" have occurred in recent times; yet, there seems to be no evidence that any fossils were formed as a result.

And, of course, this offers no explanation of the fossils of creatures of the land. Generally, one might appeal to Ockham's razor, and ask whether it is not better to suppose one large catastrophe than a multitude of local ones, all under different conditions.

Another author, in discussing certain formations, mentions "... strong indications that anorthositic massifs were formed only once in geologic history. . . ." And surely the events connected with such a formation deserve to be called catastrophic.

Megalithic Excellence and Its Implications

Megalithic structures, such as Stonehenge, continue to attract interest.⁸⁻¹⁰ It is now believed by many that such structures were astronomical observatories of some kind.

Thom, in particular, has studied the structure at Carnac, in Brittany, France, and believes that it had to do with observations of the moon at the horizon. The motion of the moon is rather complicated, and fairly complicated equipment would be needed to investigate the complications.

It is found that these structures show a very considerable knowledge of geometry and mensuration on the part of the builders, not to mention the knowledge of astronomy which they must have had to see the need of such an elaborate observatory. For one thing, comparison of

the dimensions of widely separated structures shows that the builders must have had quite accurate and permanent standards of length. Of course, creationists urge that ancient engineering should not be under-rated; pre-fabrication was practiced in the building of Solomon's temple¹¹; and the inscription found in Hezekiah's tunnel¹² shows that when it was built surveyors were able to lay out a tunnel to be excavated from both ends.

There are two reasons why these matters are of importance to creationists. In the first place, when evidence of ancient people's skill is established, creationists feel more strongly that the records which they have left should be taken seriously. (The "higher critics"—and others too—of the last century erred in this; they apparently supposed that the ancients were little more than idiots.) The Scriptural accounts of the Creation, the Flood, and other early events in the world, are such ancient records, and ought to be taken seriously.

In the second place, such evidence of ancient skill should be troublesome for evolutionists. For evolutionists want to believe that there have been men, of some kind, for a million years or so. The evidence just mentioned would show that human intelligence has not "evolved" appreciably in some thousands of years. (Indeed, the same conclusion can be reached from history: who would claim that an intellect better than that of Plato or Aristotle has "evolved" in the intervening time?)

But then, according to the uniformitarian view, there must have been a very considerable level of intelligence for hundreds of thousands of years. Yet, if that were so, why are there no remains, no monuments, going back through those ages?

One could say that a catastrophe had destroyed the relics from earlier times, and indeed creationists believe that there was such a catastrophe: the Flood; but uniformitarians are unwilling to admit any such thing. But all of this fits in well with the creationistic view of a young Earth and a human race created with abilities as great as it has nowadays.

A question which remains is why ancient men wanted to make such elaborate observations. One suggestion might be that, in some cases at least, such actions had something to do with tides. Is an extension of that theory possible? Could it be that the ancient astronomers believed that some peculiarities in the Moon's motion might give a warning of another Flood, the Flood in Noah's time being still fresh in men's minds?

A very extensive piece of work would be justified if it would give a warning of such a catastrophe. If the builders had some such notion, it does not, of course, affect the present argument

whether or not there was any foundation to their belief.

Ancient Records Valid

Recently I have been reading about some of Thor Heyerdahl's adventures. One thing which he has repeatedly found out is that ancient records, whether they be in writing, in pictures, or transmitted orally, are very reliable. Whether they have to do with how to make and erect a statue on Easter Island, with an ancient battle there, or with how to make a reed boat that will cross the Atlantic, he found that they are dependable.

Of course, this should have been known for some time. When Troy was declared to be fictional, only some excavation was needed to show that the story was based on truth. When doubt was cast upon the historical truth of Scripture, Garstang, Marston, Ramsay, and others, were able to show that the facts were just as they had been written.

Thus, by actual investigation, a principle has been established: old records are reliable. Now consider one of the events of long ago in which we are interested, for instance, the Flood. Accounts of the Flood, varying to some extent in detail but still having a core of similarity, are found among many of the World's people. And these stories are of a considerable antiquity. Thus we may say also: the story of the Flood is an old record. Then—well, I do not need to tell readers how to complete the syllogism.

Indeed, is it not possible for us, now, to see that one of the weaknesses of nineteenth century thought patterns lay just in this: in failing to give earlier peoples credit for enough knowledge or enough sense? Even some fine Christians fell into that error to some extent.

After Darwin's time, evolutionary thinking may have encouraged people to assume that knowledge and practices were the culmination of the ages; on the other hand some general opinion of that sort, already in the air, may have made it easier for evolution to get a hearing. However, this may be, the events of this century have surely been enough to destroy any notion of inevitable, unlimited, progress.

Augustine, Aquinas, and Origins

It is sometimes maintained that some of the old Christian philosophers, such as St. Augustine and St. Thomas Aquinas, taught some sort of doctrine of evolution. I think that really what is happening is that those who make such statements think that they are doing these philosophers a favor by ascribing to them a doctrine that is now popular. St. Thomas seems to have denied anything like Darwinian evolution quite plainly; he said:

(as for) . . . spontaneous generation . . . the life resulting is of a type so inferior that the general environment suffices to cause it . . . but these causes alone are not sufficient to generate the higher animals: this requires also the activity of particular causes of the same species as the animals generated. . . .¹³

In other words, like begets like. These philosophers believed that the spontaneous generation of grubs, etc., was a fact, so they had to make allowance for that. Is it not possible that some of St. Augustine's notions about "seeds" were for just that reason: he believed that some animals were generated spontaneously, but that their origin must ultimately be traced back to God? Nowadays, of course, we do not have to provide for any exceptions; we know that there is no spontaneous generation.

I am not, of course, proposing that we have to follow the opinions of these men. St. Thomas said somewhere that an appeal to merely human authority is the weakest of Arguments. But these were respected philosophers and Christians. If we can see that they had nothing at all to do with a theory that has turned out to be a godless one, so much the better.

Phase Changes and Flood Dynamics

It has been suggested that, under certain circumstances, changes of phase may happen deep underground with almost explosive speed, and that such happenings might be the cause of some earthquakes.¹⁴ As well as the common phases (or states; many treatments of thermodynamics try to maintain a distinction between the two terms) of material; viz.: solid, liquid, and gas (or vapor), there may be several other solid phases, differing in e.g. crystal structure.

Such a proliferation of solid phases seems to occur especially at high pressures; and certainly that condition exists underground. Since the different phases may differ somewhat in volume, it is apparent that a sudden change might cause motion on a large scale, and corresponding shocks.

This matter is mentioned for the following reason. There have been suggestions that, at the time of the Flood, there may have been, underground somewhere, a nuclear reaction, the effect of which was to move the Earth's crust, and to send the water over the land. The breaking up of the fountains of the great deep might have been something of that sort.

Now, it would seem that a change of phase, of the kind mentioned, could also have had the same sort of effect. Thus it may be worthwhile to think about this possibility, to consider whether, and if so to what extent, phase changes may have had something to do with the Flood.

A Single Glacial Episode

As has been pointed out in, e.g. *The Genesis Flood*, anyone who takes Scripture seriously, and who has ever seen a flood even along a river, can hardly help believing that the Flood described in Genesis must have had a great effect in shaping the Earth's surface. A problem has been to decide just which land features have to do with the Flood, and what the truth is about those features that are commonly supposed to have been caused by glaciers.

Presumably the features caused by glaciers, if indeed any have been caused thus, must have come after the Flood, for were they earlier they would have been obliterated. But there is not much time after the Flood for ice ages, if the chronology of Scripture is to be taken at all seriously. Also, if there were about four ice ages, as has been held, it is still more difficult to fit them in.

An author of a recent study of clay and other deposits in the North Sea has concluded that "... the North Sea Drift is the product of a single glacial episode."¹⁵ This observation, if it is true, does not solve all problems; but I mention it as something that might suggest to creationists some helpful way of proceeding.

Stellar Evolution and Missing Neutrinos

For several years, experiments have been conducted to detect neutrinos from the Sun. The neutrino, it will be recalled, was for a long time a hypothetical particle, neutral electrically and very light.

Now, there seems to be some experimental evidence that neutrinos exist, and are produced in certain nuclear reactions. The reaction, a process of nuclear fusion, by which the Sun is supposed to be heated, should produce many neutrinos, some of which should reach the Earth. However, the result so far seems to be that there are far too few.

One author, in commenting on this state of affairs, speaks of it as: "what appears to be a scientific crisis," and wonders, "what might be wrong with the theory of stellar evolution."¹⁶

This may serve to remind creationists that the whole theory of stellar evolution, like most other theories of cosmogony (and, it might be remarked, like most theories of evolution of anything else) is really a huge structure of speculation built on a very small foundation of fact. It is no exaggeration to say that there is at least as much evidence for Creation as for any of the uniformitarian cosmogonies.

Indeed, the evidence is of different kinds; in legal terms it would be direct testimony in the one case, circumstantial (at best), in the other. But who, when something is really at stake, would not admit that testimony is valid evi-

dence; and that, while circumstantial evidence may have its value, it is dreadfully easy to interpret it to support whatever one has already made up his mind to believe.

Moon Migration Analyzed

A recent article on the Earth and the Moon contains mention of some points that may be of interest.¹⁷ As is well known, the Moon seems to be moving slowly away from the Earth. According to one calculation the Moon was quite near the Earth about two billion years ago, which the author remarked, is puzzling, because most people today desire to have things about 4.6 billion years old.

Of course, the trouble is that the calculation is too uniformitarian, even for the purposes of the article. Something was different at some time in the past. But then one cannot say that the present is the key to the past.

As happens so often, there is no trouble here for the belief that the Earth and Moon are relatively young. The Moon may be moving slowly away from the Earth, but in a few thousand years the change in distance would not have been enough to have mattered.

An interesting point is raised in the article when the author suggested that once the Moon was within a few Earth radii of the Earth. Under those conditions, "... tides several kilometres high ...", would have occurred. Some have believed that in fact something like this did happen during the Flood; although for my part I consider something like the events suggested in *The Genesis Flood* book to have been more likely.

The author suggested also that friction would have caused so much heating as to evaporate much of the water, and perhaps even to melt some of the crust. It appears that under the circumstances considered there would be an enormous catastrophe.

The Anomaly of Saturn's Rings

The rings of Saturn are, many would agree, one of the most striking features of the Solar System. They are also one of the features which cause difficulties to any uniformitarian theory of the origin of the System. For why, among all the planets, is there only the one set of rings?

Another difficulty has been that it is hard to see how the rings could possibly be anything like as old as the uniformitarian theorists want the System to be. For almost any way of looking at the matter reveals instabilities in the rings.

Some attempts have been made to consider the rings from the viewpoint of "jet streams," and to stimulate the behavior numerically.¹⁸ It is generally agreed that the rings are composed of swarms of particles.

Surely there must be collisions between the particles, and the net effect of the collisions, if it is calculated, would be to make the rings shrink. But there are other reasons for considering that they have not shrunk much since they were formed.

It is concluded that one of two things must be true: (1) either the rings are of "rather recent origin," much more recent than the uniformitarian theorists would want to have it; (2) or else the particles do not behave "normally." Of course, those who uphold uniformitarianism do not wish to admit the first alternative; they will have to support somehow the second.

But that is not really very satisfactory as it stands; any difficulty could be met in anything by saying that something was not behaving "normally." But frequent resorts to such an excuse would surely destroy the progress of any science.

Hardwater and False Old Ages

There has been occasion to remark, once or twice before, on a source of error which is found in some attempts to find the age of things from radioactive carbon. This is the "hard-water effect." Hard water contains calcium carbonate or bicarbonate. Thus, carbon of age and origin that has no connection with that in the organic materials of certain estimated ages may become confused with the carbon in the organic materials.

Another example of this has been reported recently.¹⁹ When researchers used alternate means of finding the ages, which were considered reliable, they reported ages of hard-water which were as much as 1,700 years too old.

It would seem, then, that, even apart from the likelihood that there might have been little radioactive carbon in the atmosphere before the Flood, the hard-water effect, and possibly others, during the Flood, would make any dates given by these means for antediluvian remains worthless.

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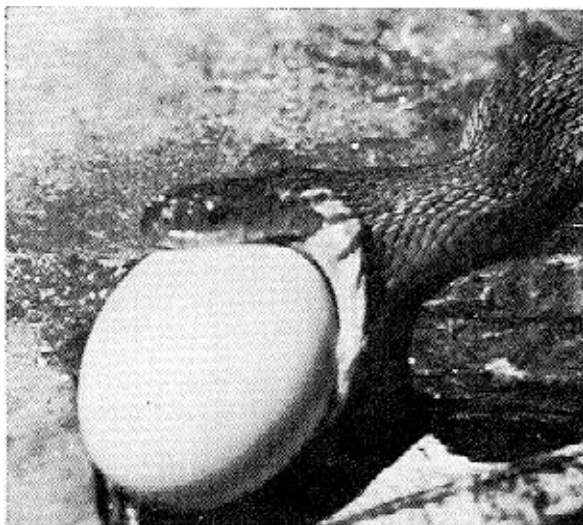
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CREATION RESEARCH SOCIETY

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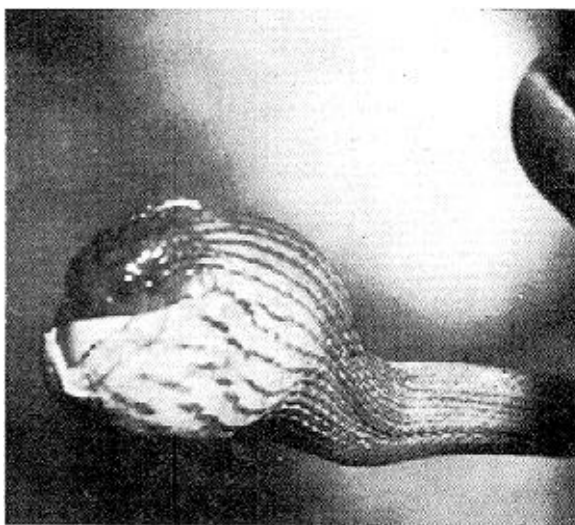
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QUITE A MOUTHFUL*



—South African Information Service, N. Y.

Figure 1. Quite a mouthful! Dinner gets underway when the Brown Egg-Eater snake manoeuvres an egg into its jaws.



—South African Information Service, N. Y.

Figure 2. That satiated look. A few wiggles and the egg is in. The Cover Illustration shows the egg at a "stage" between this view and that in Figure 3.

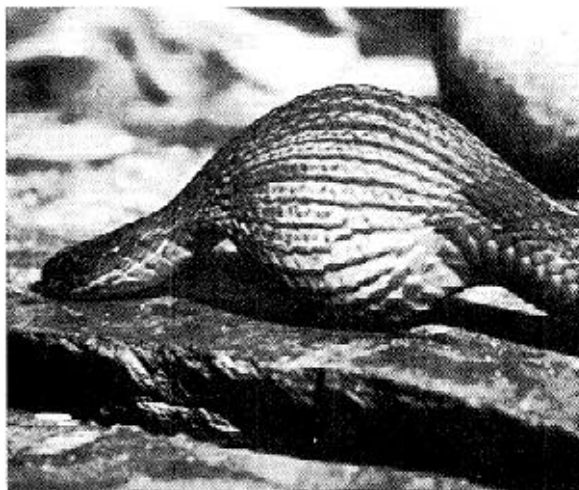
These three pictures (along with an "intermediate" view in the Cover Illustration) show that a snake really does know how to get its "teeth" into an egg; though, of course, in a strict sense the species is almost toothless.

However, this Brown Egg-Eater snake (probably *Dasypeltis scaber*) has "teeth" on its spine. James Hutton, chief photographer of the *Natal Mercury*, spent five months traveling to and from the Durban Snake Park in South Africa to get these fascinating pictures. It is difficult to photograph these snakes with a mouthful because they prefer to eat only on warm nights.

Naturally these snakes prefer to live in and around pigeon crofts and aviaries. The Brown Egg-Eater is not poisonous, grows to a maximum length of four feet, and is a good climber.

Some significant questions are: How did this Brown Egg-Eater snake gain the ability to swallow eggs—crush the eggs—retain the contents—and, then, regurgitate the shells? How do evolutionists suggest that this behavior came into existence?

Usually evolutionists "explain" adaptations as the result of some mutational changes selected for because of "survival value" to an organism. Creationists ask, then, how many mutations were involved in such adaptations as illustrated by



—South African Information Service, N. Y.

Figure 3. Special protuberances on the snake's backbone, combined with its writhing movements, crush the egg. After the egg is crushed, its contents are swallowed further down and the egg-shell is regurgitated.

the Brown Egg-Eater snake? How do evolutionists explain the appearance of mutations for "teeth" on the spine at just the time when mutations for wide-hinged jaws occurred in this snake? What empirical evidence is available?

Is this not another example of created design? Such orderly behavior could not have come about by chance events, and is clearly another instance of the work of the Creator.

*This report is based upon an article in the *South African Scope*, May-June, 1971. Permission to use the information and these accompanying illustrations was granted by the Senior Information Officer of the South African Information Service, 655 Madison Avenue, New York, N. Y. 10021.

REPORT OF 1973 BOARD OF DIRECTORS MEETING

The Board of Directors of the Creation Research Society met April 17, 1973 at the Lutheran Junior College, Ann Arbor, Michigan. The meeting was called to order by the president, Henry Morris, at 7:15 P.M. Other members present were Wayne Frair, George Howe, Wilbert Rusch, Sr., Walter Lammerts, William Tinkle, Clifford Burdick, Harold Slusher, Harold Armstrong, Thomas Barnes, Larry Butler, Duane Gish, Richard Korthals, Emmett Williams, Jr., and John Moore. John Klotz arrived the next morning, leaving only two absent, namely John Grebe and Karl Linsenmann, the former because of schedule conflict and the latter because of illness. At the opening we engaged in silent prayer.

Secretary William Tinkle read the minutes of the 1972 meeting and they were adopted.

The report of the treasurer, Richard Korthals, showed a steady increase in income during the last four years, the total for the last year being \$20,163.87. By careful planning, expenses for the *Creation Research Society Quarterly* were reduced, but there was increase in the salary of office help, postage, and the cost of travel. The expense of \$4,596.55 for writing the *Laboratory Manuals* and *Teacher's Guide* to be used with C.R.S. textbook (*Biology: A Search for Order in Complexity*) should not be repeated. The total expense for the year was \$23,389.55 and the checkbook balance is \$8,198.06. This report shows a notable gain over our status ten years ago when we started with a gift of \$500 from Dr. John Grebe.

The *Creation Research Society Quarterly*, our principal means of influence, goes to English-speaking countries and to several others, including Germany, France, Norway, Denmark, Japan, Israel, and Portugal. This influence is increasing, and the Directors voted thanks to the editors.

In the report on research, directed by Larry Butler, Emmett Williams showed a sample of the work of George Mulfinger on the rate of growth of stalactites. Burdick is continuing his research in geology in the West. Tinkle reported, as a supplement to his tests on mutant tomatoes having three cotyledons, that they bear less fruit than the normal type.

A total of 35,000 copies of *Biology: A Search for Order in Complexity* have been published. A Second Edition will be completed for the next printing. The *Teacher's Manual* to accompany this high school textbook is now available at Zondervan Publishing House, Grand Rapids, Mich. and the *Students Laboratory Manual and Teachers Laboratory Manual* will be available before this report is published.

The two books of selected C.R.S. *Quarterly* articles, *Why Not Creation?* and *Scientific Studies*

in *Special Creation*, Presbyterian & Reformed Publishing Co., Nutley, N. J., have had a good sale. Each will be published as a second edition in paperback. The publisher advises that the next anthology should be a single volume, of more pages than the first volume but less than the two combined.

The membership secretary, Wilbert Rusch, Sr., reported a steady gain in membership. In 1968 we had a total of 970 members and subscribers; in 1973, 1999. Of this total, 412 have an advanced degree in some branch of science and have the rank of voting members.

Saturday, April 28, we assembled in the same room at 8:30 A.M. and started the meeting with silent prayer.

Williams showed an index which he has compiled for the 1964-1965 C.R.S. *Quarterly*. Board members encouraged him to continue to make these indices for publication and sale in some form.

Rusch moved and Butler seconded that we advertise in *Christianity Today* magazine. The discussion which followed mentioned *Science* magazine instead, the danger of cheapening our stand, and our general fund problem. A motion was made by Lammerts, seconded by Barnes, to table the matter, and the motion passed. Rusch was appointed to study the cost of advertising and report at the next meeting.

It was moved by Rusch and seconded by Moore that funds from the sale of anthology books be placed in the general fund for the support of the *Quarterly*. The motion carried.

Although the Federal government has appropriated much money for research and publication, the Board decided not to apply for nor accept money from this source but to continue our policy of raising our own funds. We also call attention to our established policy of using none of the money of the Society for lobbying or attempting to influence legislation. It is only as individuals that we use our influence to aid that which we personally support.

Board members decided to have samples of the *Quarterly* displayed at all Library professional meetings for the next year.

All dues and subscriptions were raised one dollar a year because of the rising costs of publishing and mailing.

The theme for the Annual Issue of the *Quarterly* for 1974 will be: competing philosophies of origins; the philosophic aspects of creation. Harold Armstrong was unanimously selected as Editor of the *Creation Research Society Quarterly*, his duties to begin with the Annual Issue, June 1974. He was given the liberty to make each issue of the length necessary to contain

quality papers. Acknowledgment was made of the five year service of Editor George Howe.

The secretary reported that the six men nominated as directors by the Board were elected by large majorities and there were but few write-in votes. The president ruled that the expiration dates of the members are as follows:

1974

Duane Gish
Harold Armstrong
Thomas Barnes
Emmett Williams, Jr.
William Tinkle
Larry Butler

1975

Clifford Burdick
John Grebe
Wayne Frair
Karl Linsenmann
John Moore
George Howe

1976

Walter Lammerts
Harold Slusher
Henry Morris
John Klotz
Richard Korthals
Wilbert Rusch, Sr.

The six whose terms expire in 1974 were nominated for reelection in that year, to serve three years.

Election of officers resulted as follows: President, Thomas Barnes; Vice President, Emmett Williams, Jr.; Secretary, Wayne Frair; Treasurer, Richard Korthals; and Membership Secretary, Wilbert Rusch, Sr.

A vote of appreciation was passed for Morris' work as president. A similar motion gave thanks to Tinkle for his work as secretary.

The next annual meeting will be held at the same place, April 19 and 20, 1974, convening at the Frontier Restaurant 5:00 P.M.

This successful and effective meeting adjourned about 4:30 P.M.

WILLIAM J. TINKLE,
Secretary

BOOK REVIEWS

Evolution or Degeneration—Which? by Hilbert R. Siegler. 1972. Northwestern Publishing House, Milwaukee, Wisconsin 53208. 125 pages. \$3.00. Paper cover.

Reviewed by Frank L. Marsh*

So accustomed is the reading public to the prevailing idea of change of life forms toward complexity, it may be almost startling to know that a small book is now available in which the avowed purpose of the author is to show that actually a process of general degeneration has been and is at work in the Universe.

Author Siegler recognizes that his case stands or falls depending on how well he succeeds in substantiating three propositions: (1) That no phase of the currently accepted theory of evolution is irrefutable; (2) That the theory being proposed to define the method (process) of how change takes place in no way conflicts with the teaching of the Bible; and (3) That the solution proposed satisfactorily explains all known natural phenomena.

Siegler's theory of degeneration in the organic realm is the *a priori* assumption that in the Creation original types of plants and animals were created. These type forms were heterozygous and endowed with the greatest potentialities for variation. These original forms were also superior from a morphological standpoint. This original

endowment made them more capable than present-day forms of adapting themselves to a variety of situations.

As a result of the derangement accompanying the advent of sin (Genesis 3:17-19 is quoted) from this state of highest potential, a process of degeneration set in. This came about through isolation of groups and consequent inbreeding accompanied by mutation with the result that races and subgroups were produced which had reduced hereditary potentials.

That these divisions of the original gene pools did not result in even more degeneration and decay than is actually observable was due to opposing forces which included the energizing rays of the sun, and the constant revitalization of organisms through cross-fertilization and through the winnowing effect of natural selection as the less fit were removed. Because these offspring "species" carry with them but a fraction of the hereditary variability found in the parent gene pool, Siegler contends that all these processes of change have been degenerative.

Near the middle of this book the author includes a most interesting chapter on taxonomy. In this he refers to the various species concepts of Huxley, Blair, Dobzhansky, and particularly that of Mayr. His chief object is to call attention to the fact that although "systematists have designated a vast multitude of plants and animals as species, it is still impossible to find general . . . agreement as to a precise definition of the term 'species'." Siegler says that an applica-

*Frank L. Marsh, Ph.D., is professor emeritus of biology, Andrews University, Berrien Springs, Michigan.

tion of the theory of degeneration can eliminate much of this taxonomic confusion.

In the first place, as we accept the fact that there was no progressive evolution, the term "phylogeny" becomes of no use, and the concept of common genetic relationship among original types becomes meaningless. The higher categories such as phylum, (class), order, and family could remain and simply be designations for arbitrary groupings used for the convenience of systematists.

The author believes that because many of the originally created type forms have unwittingly been placed by evolutionist taxonomists in the present "genus" category, and that this is also the case with the "family" or even in larger groupings, it is in these categories where a vast reshuffling may become necessary. He proposes that the term "genus" be applied to the type forms originally created.

The term "genus" would, then, be the only one of all taxonomic terms applicable to a natural category. . . . (and) could then be defined as the category including all individuals of a plant or animal group which must have originated through degeneration from the one originally created kind. . . . *Cross breeding between individuals of two different genera would be impossible.* (Emphasis by the author.) (p. 39).

As a summary on taxonomy, Siegler states that on the basis of his theory of degeneration, there would be at least two criteria to help the taxonomist determine which species to group in a genus:

- (1) All individuals which can successfully crossbreed to the extent that ova are impregnated, even if these finally prove non-viable, must be members of the same genus; and
- (2) All individuals which can successfully crossbreed to the extent that ova are impregnated must be in the same genus with any other individual which can successfully crossbreed with related individuals.

A third criterion is suggested by the author in the following words (page 44): "This (criteria 1 and 2) would, of course, take care of only a very small fraction of all living organisms. I believe the best approach to the remainder would be automatically to combine all "species" which show a morphological similarity."

As an illustration of the use of this third criterion, morphology, this reviewer would suggest two species of vinegar flies, *Drosophila equinoxialis* and *D. willistoni*. Dobzhansky reported (in "Complete Reproductive Isolation between Two Morphologically Similar Species of *Drosophila*," *Ecology*, July, 1946, vol. 27, page 209) concerning their similarity of appearance that "the differences are, however, so small that

single individuals of the two species cannot be distinguished by inspection not only in museum material but even in living flies."

Concerning the breeding behavior between these two biological species, Dobzhansky continued, "The reproductive isolation between them is complete." Even though these two species of vinegar flies are cross-sterile, the close similarity (identical in this case) of their morphology indicates to at least many creationists their membership in the same basic type (i.e., Genesis kind), vinegar flies.

Siegler's specification of impregnation of the ovum, even if it finally proves non-viable, as a test for the Genesis kind, makes his book unique in creationist literature. Creationists generally tend to speak vaguely of the Genesis kinds as they exist today, but the author of this book zeros right in on the problem. This reviewer agrees with him here 100 per cent.

It would appear that the author believes he is the first creationist in recent times to offer a specific name for the Genesis kind, and to suggest a specific test for its discovery. Apparently he has missed the reviewer's suggestion of the name "baramin" for the Genesis kind, and *true fertilization* of the egg, even if the embryo proves non-viable, as a test for its discovery in nature which appears in his books: (1) *Evolution, Creation, and Science*, 1947, pages 174, 175, 200; (2) *Studies in Creationism*, 1950, pages 248-49; and (3) *Life, Man, and Time*, 1967, pages 138-39. (See also *Creation Research Society* 1964 Annual, page 36, and *Scientific Studies in Special Creation*, Edited by Walter E. Lammerts, 1971, page 150.

It is significant that two creationist biologists, after a careful study of the whole problem, have independently concluded that members of a single created type can be distinguished by the fertility test even if the resulting embryo dies at an early stage of development.

In the opinion of this reviewer, Siegler could better have chosen as a name for the present-day Genesis kind a word not now used in taxonomy. When the word "genus" is used for the basic kind different pictures arise in the mind of the creationist and the mind of the evolutionist. Wherever "genus" was used it would be necessary in each case to indicate whether reference was being made to Siegler's genus or that of the evolutionist. It was for this reason that in 1941 (*Fundamental Biology*, page 100) this reviewer suggested the name "baramin" (created kind) because it could not be confused with any term in modern taxonomy.

At the present time there apparently is no classification category which is synonymous with the Genesis kind. In one case it may consist of individuals of a species (as in *Homo sapiens*), while

at the other extreme its population may be made up of families of an order (as suggested by the crossing of Family Phasianidae with Family Meleagrididae, the domestic fowl with the turkey, both members of the Order Galliformes). On pages 45-46 Siegler refers to the fact of generic crosses, all of which would suggest to this reviewer that a better term than "genus" might be selected to indicate the Genesis kind.

With regard to what would constitute a species according to the theory of degeneration, Siegler first makes it very clear that the kind of plant or animal represented in modern taxonomy by the term "species" is *not* the "kind" referred to in Genesis. If this fact is born in mind an important area of misunderstanding between creationists and evolutionists will disappear.

In Siegler's opinion species must be regarded as *artificial* units. He believes that the concept of species is such that it is simply a working tool to be used by the taxonomist in describing different plants and animals. He would suggest as a description of a species the one given by Huxley (*The New Systematics*, 1940, page 17):

(Species) are groups which (a) have a geographical distribution area; (b) are self-perpetuating as groups; (c) are morphologically (or in rare cases only physiologically) distinguishable from other related groups; and (d) normally do not interbreed with related groups, in most cases showing partial or total infertility on crossing with them (though neither the lack of crossing or of fertility is universal).

Siegler's chief difference with Huxley here is that what Huxley thinks is a natural unit, Siegler considers to be merely an artificial (i.e., arbitrarily distinguished) unit.

The present reviewer, a special creationist, from the standpoint of unity, convenience, and practicability, has never seriously considered any other course in classification than to use whatever taxonomic categories the evolutionists wish to set up, the while bearing in mind that the basic types were specially created, with the result that commonly no genetic relationship may exist among the populations of different taxonomic categories. In the reviewer's opinion a creationist classification would be a challenging and interesting endeavor, but it would possibly largely be love's labor lost because evolutionists would not use it, and the resulting confusion would finally bring taxonomy to a complete impasse.

On the subject of the origin of the cosmos, Siegler directs attention to the fact that both the "continuous creation theory" and the idea of a catastrophic beginning ("the big bang theory") conflict with a creationist explanation based on the theory of degeneration. In the latter view the Universe was created with vast potentialities, after which degenerative processes set in. The

fact, accepted by most scientists, that entropy appears to be increasing apparently lends tremendous support to Siegler's degeneration theory.

Space does not permit me to enter into any detail regarding Siegler's treatment (pages 56-85) of his first proposition listed in the first paragraph of this review, that no phase of the currently accepted theory of evolution is irrefutable. The points touched upon are those usually produced as evidence for the theory of evolution, namely those in the areas of morphology, vestigial organs, embryology, geography, geology and paleontology, and radioactive dating.

Siegler leaves exhaustive argumentation in refutation of the evidence drawn from these disciplines to many other creationist writers, a few of whom he names and lists in his Bibliography. He states as the purpose of this section of his book an "intention simply to demonstrate that there are counter arguments just as logical as those advanced to prove the theory of evolution, and to show that many of the arguments so glibly advanced contain fatal weaknesses." Nevertheless this chapter (Chapter 5) deserves a careful reading by the student of origins.

A unique character of Siegler's book is the inclusion of two tables in the back, one of mammalian hybrids and another of bird hybrids. He has collated these from reliable sources, and they make a handy reference for the student who wishes seriously to know to what extent crossing is known to have occurred among hairy animals and among feathered animals. The geological timetable developed by uniformitarians is also included in the back for handy reference, and also a helpful glossary of technical words used in the text. The volume also includes a bibliography of 105 references. The only thing this reviewer looked hopefully for and could not find was an index. A book of this high quality deserves a good index for the help of the searching student who will return to it from time to time.

Hilbert R. Siegler is a mature biologist. Since 1944 he has headed the Game Management and Research Division of the New Hampshire Fish and Game Department. Previous to that he held a similar position in eastern Texas. He has an M.A. degree in zoology which was earned at the University of Wisconsin. His book is delightful to the serious student of origins in that from beginning to end it is in complete harmony with demonstrated science. The author knows his ground and takes the pains to present the facts accurately.

In the opinion of this reviewer, this volume should win the sincere gratitude of creationists for Siegler's truly pioneer work in the area of identification of the created units as they appear in our modern world, a work which aids greatly in a verification of the natural truth found in a literal Genesis.

Correlation of the Bible and Science by Edward F. Blick. 1972. Distributed by the author, 1727 Crestmont, Norman, Oklahoma 73069. Booklet. 15 cents.

Reviewed by Emmett L. Williams*

Dr. Blick has written a very interesting pocket-sized booklet to challenge many students with creationist-centered science and hopefully to win some of them to Christ.

An amazingly large number of technical topics are covered in 16 pages. One outstanding feature of the booklet is that many references are given for further study. This is superior to many creationist tracts the reviewer has read that would lead people to believe that creationism can be defended "in 20 words or less," or that the particular writer has completely covered the spectrum of creationist arguments.

Any serious student can do further reading in the references offered by Dr. Blick. Many Creation Research Society articles are suggested as sources of more information.

The author tackles the very thorny problem of the age of the earth and the radioactive dating methods. Many creationists like to avoid this area feeling that they make more enemies than friends. But what a person assumes as to the age of the earth, will in many cases determine how he views the theory of evolution. A person that accepts a young earth will have very few problems in rejecting evolutionary speculations. Dr. Blick shows the inconsistencies of potassium-argon dating, the current favorite of uniformitarian scientists. Evidences are given that would suggest a young earth.

A lengthy section is devoted to the scientific impossibility of the theory of evolution. Ideas derived from the second law of thermodynamics are used to good effect. Regardless of the mental gymnastics of evolutionists and their "evangelistic" apologetists the direction of natural processes, as epitomized in the second law, is opposed to the supposed direction of evolutionary processes. Other areas covered in the booklet are astronomy, aerodynamics (the author's field), archaeology, meteorology, ichthyology, medicine, geology, and statistics.

The reviewer highly recommends this work. It is quite refreshing to read material by a qualified scientist that correlates true science to the Bible. So often evangelical writers are interested only in correlating the Bible to evolutionary speculation. If you know a student that is grappling with the evolution vs. creation problem, send him this booklet.

*Emmett Williams, Ph.D., is professor and chairman of the Department of Physics, Bob Jones University, Greenville, South Carolina.

"Immanuel Velikovsky Reconsidered," May, 1972, *Pensée* magazine. Student Academic Freedom Forum, P.O. Box 414, Portland, Oregon 97207. \$2.00.

Reviewed by James E. Strickling*

Relatively few people recognize the name of Immanuel Velikovsky; fewer still are aware of the implications of his work. From within the scientific community this man has dared question the Doctrine of Uniformitarianism by propounding a theory embracing the concept of global catastrophism in historical times; a view formerly confined primarily to the ranks of fundamentalists. His claims precipitated an unprecedented outcry from the scientific hierarchy.

Access to scientific journals and other media have been denied Velikovsky to the extent that any extensive publication dealing with his work is noteworthy. The May 1972 issue of *Pensée* magazine, the subject of this review, is the most recent of very few such publications.

Velikovsky's first book, *Worlds in Collision*, published in 1950, was a best seller and is still popular in paperback form. It was the first of four that cut across the fields of astronomy, geology, archaeology, paleontology, history, and mythology; shaking the foundation of every discipline touched.

Many leading members of the scientific community branded Velikovsky a crackpot. (A notable exception was Albert Einstein.) A few weighed his claims objectively; many rejected them without knowing what they are. He was ridiculed, libeled, and finally ignored. Scientific investigations have substantiated many of his claims, but official recognition has not been forthcoming in even "the smallest footnote acknowledgment in a learned publication." (p. 8)

In the introduction to this special issue of *Pensée*, the editors state:

Pensée is not a technical journal. It ventures into matters scientific and historical quite timidly, and only to help fill the void created by the refusal of specialized journals to acknowledge the vitally important questions raised by Velikovsky's scholarship. We do not attempt here to present "both sides of the issue." It is Velikovsky's views which have been systematically excluded from the scientific media, not those of his critics.

The scope of Velikovsky's work as an interdisciplinary scholar easily overwhelms a reader. (We do not here pretend to offer more than a fragmentary look at that work. Velikovsky's opus magnum, *Ages in Chaos*, is

*James E. Strickling, B.S.E.E., works in the field of statistics for industrial quality control. He is presently doing graduate studies at the University of North Carolina in Greensboro.

not even discussed in this month's issue.) (p. 4)

The intent of the publication is served by its spectrum of coverage. Following the introduction is a short biography of Dr. Velikovsky and then fourteen articles and a forum bearing on his studies coming from various contributors; three by Velikovsky himself.

David Stove summarizes Velikovsky's reconstruction of events in a scenario of global upheavals based on *Worlds in Collision* and *Earth in Upheaval*. (pp. 8-10) This enables the reader to more easily grasp the scope and appreciate much of the detail of Velikovsky's work without the encumbrance of the massive documentation required in his books. Anyone intending to read his books would benefit by reading this article first.

Three contributions present a description of the reaction to Velikovsky's work. Such unethical and irresponsible behavior on the part of many leading scientists would be almost unbelievable were it not so well documented. The reader can see from the following quotes why the dogma of uniformitarianism is so well entrenched in our educational institutions:

"The professional scientists' campaign against *Worlds in Collision* began well before the book appeared." This was led by Harlow Shapley who arranged for denunciations of the book by scientists who had never read it. Shapley and others then "... forced the sacking of the Senior Editor of Macmillan responsible for accepting the Velikovsky manuscript" as well as that of the director of the "... Hayden Planetarium in New York, because he proposed to take Velikovsky seriously enough to mount a display about the theory." Macmillan finally "... prevailed on Velikovsky to let them transfer their best-selling property to a competitor, Doubleday, which, as it has no textbook division, is not susceptible to professorial blackmail." (pp. 6-7)

One author deviates slightly from the stated intent not to present "both sides of the issue." Dr. Derek York takes issue with Velikovsky's claim of a recent (historical times) molten lunar surface on the basis of dates yielded by lunar samples obtained on the Apollo missions. This serves to introduce an article (a rebuttal) by Velikovsky calling into question the dating processes employed and at the same time advocating thermoluminescence dating to determine when the surface was last molten (not its age).

The author of one of the most interesting articles delineates Velikovsky's record of successful predictions and many that have not yet been investigated. A writer in *American Behavioral Scientist* is quoted: "Seldom in the history of science have so many diverse anticipations—the natural fallout from a single central idea—

been so quickly substantiated by investigations." (p. 11)

Velikovsky's predictions are too numerous to list here, but they encompass planetary electromagnetism, comets and meteorites, Mercury, Venus, the earth, the moon, Mars, Jupiter, Saturn, Pluto, and ancient history including the Deluge and polar ice formation. His view of the Deluge is not compatible with the collapsing vapor canopy theory. He contends that the cause was extra-terrestrial and that the moon was innundated as well as the earth. However, this does not preclude the possibility of such a canopy having existed prior to the Deluge and being destroyed during an extra-terrestrial encounter.

There are several other articles of interest including a survey of problems bearing on Velikovsky's theory that still require investigation. Velikovsky presents a discussion of Gerald Hawkins's book, *Stonehenge Decoded*, and gives his own views on Stonehenge (in England).

The Christian Community has largely ignored Velikovsky because of his completely materialistic approach. This approach weakens the impact of his work as far as the creationist is concerned; however, his prognoses, based on his theory, have proven correct in so many instances, that to ignore him is to take the stance of the proverbial ostrich.

The scientific community's furor over Velikovsky arose in part because Velikovsky himself is a member of that community. If he were a professed fundamentalist, the furor would probably not have materialized. Velikovsky has not divorced himself from the ranks of the non-fundamentalists even though he is accused of having done so.

During an interview aired last February and presented in *Pensée*, Velikovsky stated:

I'm not a fundamentalist and I oppose fundamentalism. I consider any work written by a fundamentalist—say on geology or paleontology—as of reduced value (even though it may have some interesting facts brought together) because there is an axe to grind. You cannot approach the Bible differently than you approach any other source. I found, however, that the Old Testament is a carefully composed history. I was gratified to discover that it is basically a truthful document. (p. 49)

Although fundamentalists were not aware of the mechanisms used by God whereby many of the upheavals recorded in the Bible occurred, Velikovsky has shown (albeit unintentionally) that their continuing faith in God's Word while it was under attack for the last hundred years was not misplaced.

The magazine is a good introduction to Velikovsky for those not already familiar with his work and interesting reading whether one agrees with him or not. Clearly there are few scientific disciplines unaffected by his studies, and non-uniformitarians will agree that the affected dis-

ciplines require fundamental changes in the concepts on which they are based.

Students of Velikovsky will be pleased to note that the editors of *Pensée* intend to report other aspects of his studies, notably history, in future issues.

LETTER TO THE EDITOR

More on Stalactites

I want to share with you more evidence concerning the rapid formation of stalactites, such as appeared in the September and December, 1971 issues.

Fort Pickens State Park is on the western tip of Santa Rosa Island, across from the Pensacola Naval Air Station. Old Fort Pickens was constructed in the 1830's. In Figure 1, if you look closely at the ceiling above the people you will see a number of very thin stalactites, some of them measuring as much as 13-24 inches! These were the longest I found, and I think that is rather interesting in light of the fact that this structure is only about 140 years old.



Figure 1. Viewers point toward very thin stalactites, some measuring 13-14 inches long.

The structure is quite similar to a natural situation. The archways from which these formations are suspended are constructed of brick, only a few layers thick. Above this brick lies a few inches of soil in which the scant vegetation com-

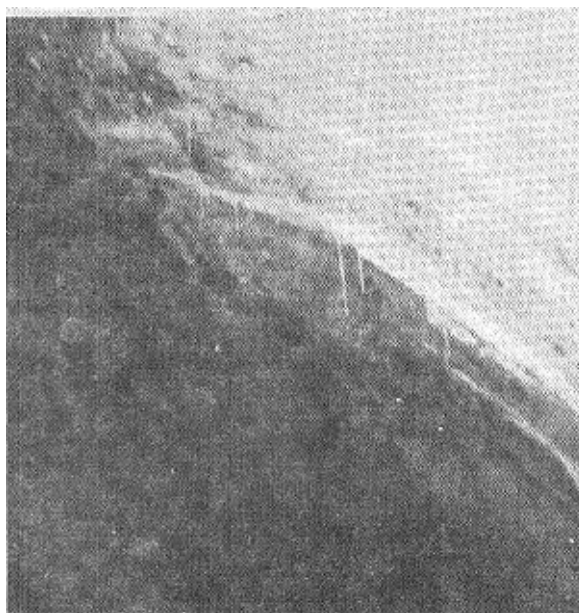


Figure 2. Close-up view of smaller stalactites.

mon to this very sandy island grows, thus providing a certain amount of camouflage from the sea. Most of the material for the stalactite formation comes from the mortar. The structure as a whole is very similar to a natural cave.

Figure 2 is a close-up view of some smaller stalactites (up to about 11 inches long) growing from one of the archways similar to those seen on the right side of the room in Figure 1.

There is a much more recent structure used up into the 20th century inside which beginning stalactites are found. This structure is a concrete and steel fortress three tiers high. Therefore, much of the water from one layer to another would be involved. This seems like an almost impossible situation for stalactite formation; yet, there they are, hanging from the cracks around the rusty I-bars in the basement ceiling! These are quite small, the longest being perhaps an inch and a half, but, then, all showed evidence of being broken off by curious park visitors.

Figure 3 is perhaps the most meaningful of all the photos in this series. The structure in the background is a cooler used when a small number of men were stationed in more modern buildings on this reservation temporarily during World War II.

Food and other perishables were stored in the cool air of the underground fortress, and it is inconceivable that the army would have allowed limestone drippings to take place during that time, when the room pictured was still very much in use. Therefore, it would appear that the stalactite formations clearly visible now, some of which are obviously over two inches in length, must have developed over a period of a mere 25-30 years.

Sincerely yours,

JAMES C. BRADY
3411 W. Gadsden St.
Pensacola, Florida 32505

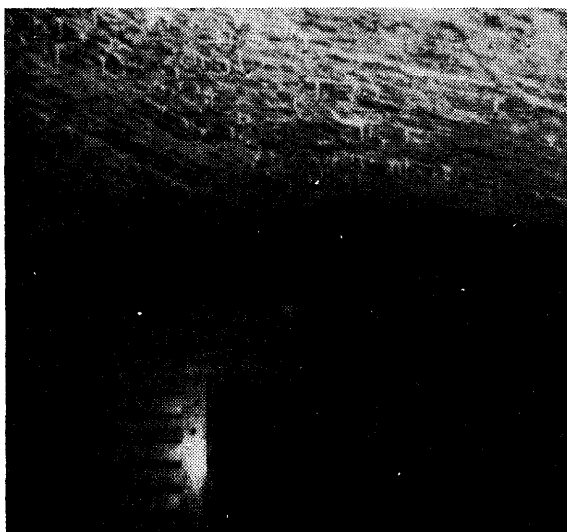


Figure 3. Two-inch stalactites probably formed in the last 25-30 years.

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 400 voting members (with graduate degrees in science) and over 1500 non-voting members. The *Creation Research Society Quarterly* has been gradually enlarged and improved and is now recognized as probably the outstanding publication in its field.

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

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

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

We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. In 1970 the Society published a textbook, *Biology: A Search for Order in Complexity*, through Zondervan Publishing House, Grand Rapids, Michigan 49506. 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.

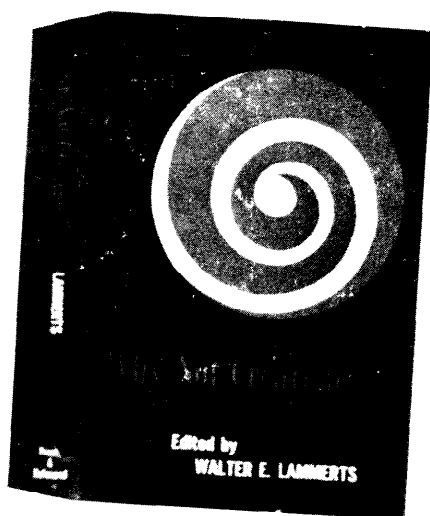
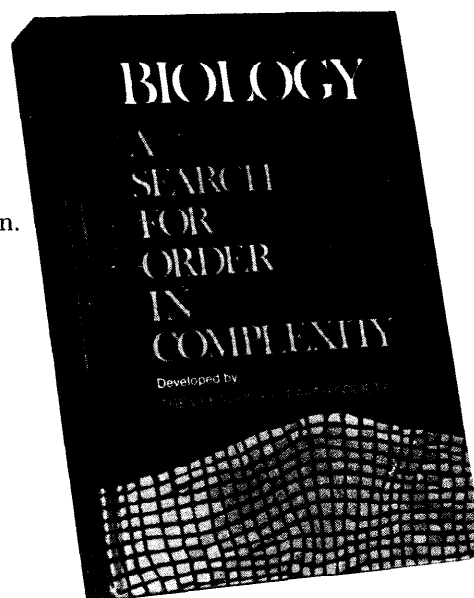
4. We are an organization of Christian men of science who accept Jesus Christ as our Lord and Saviour. The account of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Saviour for all mankind. Therefore, salvation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

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A textbook for high schools presenting creation AND evolution.

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Baker Book House, Grand Rapids, Michigan, and Presbyterian and Reformed Publishing Company, Nutley, New Jersey. \$7.50

SCIENTIFIC STUDIES IN SPECIAL CREATION

Additional articles from *Creation Research Society Quarterly*, 1964-1969.

Baker Book House, Grand Rapids, Michigan, and Presbyterian and Reformed Publishing Company, Nutley, New Jersey. \$6.95



APPLICATION FORM FOR THE CREATION RESEARCH SOCIETY

Four Groups can receive our quarterly publication. They are:

- 1) *Voting Members:* these shall have an earned degree in some recognized area of science at at least the level of the master's degree (M.A. or M.S.)
- 2) *Sustaining Members:* these are people with or without advanced degrees in an area other than science, who are interested in the work of the CRS.
- 3) *Student Members:* these include high school and undergraduate college students, who wish to become acquainted with the work of the Society (CRS).
- 4) *Subscribers:* these include all libraries, schools, churches and other organizations, as well as any individuals who wish to know what the Society (CRS) is doing, but who feel that they cannot sign the statement of belief. Organizations, by their very nature, cannot sign statements of belief.

In addition, all members (categories 1, 2, and 3 above) must subscribe to the following:

1. The Bible is the written Word of God, and because we believe it to be inspired thruout, all of its assertions are historically and scientifically true in all of 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 Creation Week as described in Genesis. Whatever biological changes have occurred since Creation have accomplished only changes within the original created kinds.
3. The great Flood described in Genesis, commonly referred to as the Noachian Deluge, was an historical event, worldwide in its extent and effect.
4. Finally, we are an organization of Christian men of science, who accept Jesus Christ as our Lord and Savior. The account of the special creation of Adam and Eve as one man and one woman, and their subsequent Fall into sin, is the basis for our belief in the necessity of a Savior for all mankind. Therefore, salvation can come only thru accepting Jesus Christ as our Savior.

(tear off and return)

MEMBERSHIP APPLICATION BLANK

I fully subscribe to the Statement of Belief of the CRS as stated above, and submit my application as one of the following:

- () Voting Member; dues \$8.00/year (\$9.00 foreign)
() Sustaining Member; dues as above.
() Student Member; dues \$4.00/year (\$5.00 foreign).

Since I do not subscribe to the Statement of Belief (or represent an organization):

- () Subscriber; dues \$11.00/year (\$12.00 foreign).

My membership should begin with the June 19____ copy of the Annual Issue, since the publication year begins in June and continues through September, December and March.

Name_____Street_____

City_____State_____Country_____

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University granting degree_____Year_____

Presently associated with_____

Please complete this blank and return with the proper remittance to the membership secretary:

Wilbert H. Rusch, Sr.
2717 Cranbrook Rd.
Ann Arbor, Mich. 48104
Phone 313 - 971-5915

Please make out checks to the Society (CRS). Please DO NOT send cash.