

# Creation Research Society Quarterly

20th

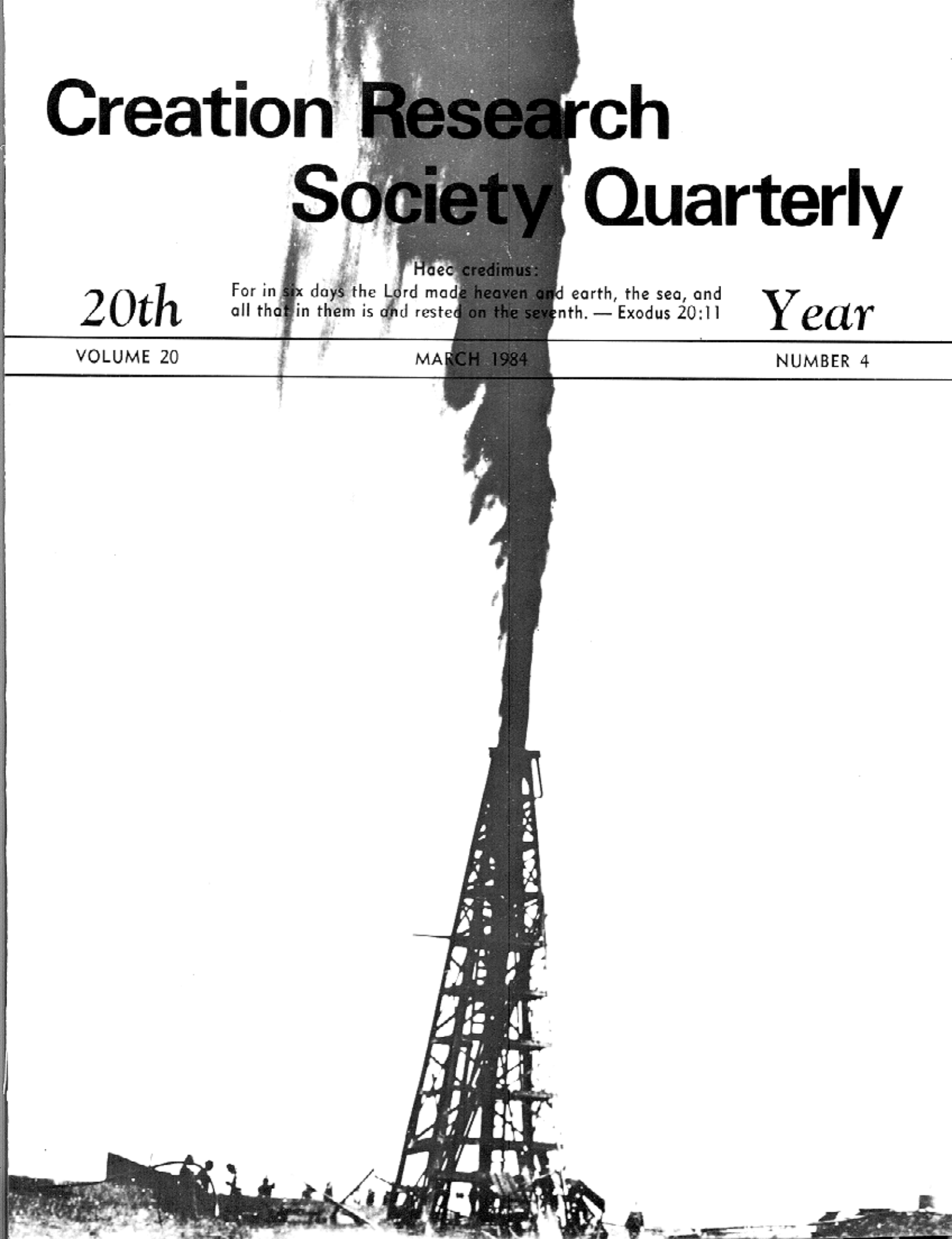
Haec credimus:  
For in six days the Lord made heaven and earth, the sea, and  
all that in them is and rested on the seventh. — Exodus 20:11

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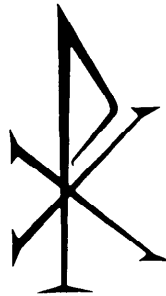
NUMBER 4

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## COVER ILLUSTRATION

The picture on the front cover is a photograph of the Lucas gusher oil well at Spindletop, Texas, in 1901. The well was 1,020 feet deep when it began to flow. The pressure pushed 700 feet of drill pipe out of the hole, while the oil gushed 200 feet high. (The derrick is about 60 feet high.) At that time, 50 barrels per day had been considered a tremendous rate of flow; but the Spindletop well flowed oil at the rate of 84,000 barrels per day. (Modern Saudi wells flow at a rate of 10,000 to 12,000 barrels per day.)

Information along with the photograph says: "There has never been another well in the United States like the Lucas Well at Spindletop, which came in on January 10, 1901. Drilled by Captain Anthony Lucas, the well proved the feasibility of drilling in salt domes in flat country, opened up Texas as a major producing

area, and showed that the oil industry could produce in quantities hitherto undreamed of. Modern drilling techniques control underground pressures and prevent old-time gushers."

This picture was provided by the American Petroleum Institute, Washington, D.C., and is used here by permission. Mr. Glenn Morton attended to getting it for the *Quarterly*.

The enormous underground pressures, shown by gushers such as this, provide evidence that the deposits of oil cannot be as old as is sometimes supposed, but, rather, must be relatively young. For otherwise the pressure would long since have been dissipated by the inevitable leakage. This point is discussed at greater length in an item by Mr. Morton, in *Panorama of Science*, in this issue of the *Quarterly*.

# THE ADULT COMMON FROG *RANA TEMPORARIA* L.: A LINKOLOGICAL EVALUATION

GERALD H. DUFFETT\*

Received 29 September 1983, revised from 9 February 1983

*Fossils of allegedly ancient frogs show that adult frogs have always resembled frogs. Therefore, the bulk of this article considers evidence which is intra-somatic and ecological, rather than comparative and evolutionary. It is based firmly upon Biblical principles and has potential, which only computers can help biologists to achieve in the quest for the full appreciation of the 'design-linkage,' that is the observed evidence for Special Creation. Although water appeared before dry land, creationists may safely assume that adult frogs were formed first and not spawn or tadpole stages.*

## Plan of the Article

### Introduction

- 1 DRAWING A BLANK
  - 1.1 *Vieraella* fossil
  - 1.2 Vital functions
- 2 DELVING INTO BASICS
  - 2.1 Observable linkage
  - 2.2 Original lack
- 3 DESCRIBING LINKOLOGICAL CONCEPTS
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### Introduction

Belief in Special Creation allows biologists to assume things about the frog, which evolutionists could never have begun to consider. In the first place, it was the adult stage which was formed and not the spawn or tadpole stages. Secondly, although adult frogs breed to form offspring, which culminate in their metamorphosis to resemble them 'after their kind': nevertheless, it seems safe to say that present-day frogs are not quite like those formed in the Original Creation. Before the Curse following the Fall of Man, no animal ever fed upon another to kill it for food. Therefore, originally frogs never fed upon invertebrates such as worms and flying insects, but only upon lush algae. Perhaps the toothless nature of present-day frogs is a relic of that deathless ecosystem in which only green plants and fruit were given for food. Also, in the primeval food chains, no consumer ever ate another deliberately. Therefore, the frog itself did not appear upon the menu of any passing grass snake or heron as is the case nowadays. Thirdly, before the Deluge the

climate was fairly warm without the present-day marked seasonal changes, so there was no need for antediluvian frogs to hibernate. But, as in the Parable of the Sower and in Darwin's observations, there is in the present ecosystem a struggle for existence termed 'environmental resistance' as well as varying success in breeding termed 'differential reproductive capacities.' It is in that post-diluvian setting that the adult frog must interact. That is why this article deals with the actual condition of anatomy and physiology of adult frogs that exists nowadays.

### 1 DRAWING A BLANK

The adult frog shows a remarkable constancy of body plan. That is all the more evident since the discovery that the fossil *Protobatrachus* (formerly named *Triadobatrachus*) is really a specimen of the late tadpole stage, instead of being at the adult frog stage as was previously believed. Therefore, its ribs and tail do not represent an earlier stage in frog evolution, although that species was found in rocks classified as Triassic.

Similarly, the fossil species named *Miobatrachus* is nowadays reckoned to represent the larval stage in the metamorphosis of the labyrinthodont amphibian *Amphibamus* (alias *Mazonerpeton*, *Mordex*, *Pelion*, *Peliontonius*, *Platyrhinops*, *Potamochoston*, *Raniceps* and possibly also named *Eumicrerpeton* and *Micrerpeton*) whose adult stage also occurs in rocks classified as Middle Pennsylvanian (= Upper Carboniferous).

#### 1.1 *Vieraella* fossil

When commenting upon frog fossils, Professor Romer, in 1966, admitted the following:

Although these finds carry the story far back in time, they do not tell us much of frog evolutionary history, for even the 'primitive' frog families differ only in relatively minor features from the more 'advanced' ones. The basic pattern of anuran structure was already established by the early Jurassic and exemplified by the South American—*Vieraella*—essentially a modern frog in its general adaptations, despite its great age.<sup>1</sup>

#### 1.2 Vital functions

Clearly evolution has drawn a blank. The fossil record can shed no light upon the significance of the timeless structure of the adult frog. Therefore, the key to understanding adult frog design must lie in a different approach which is what the rest of this article is about.

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The proposed new approach is termed 'linkology.'

In effect, linkology deliberately turns its back upon evolution in order to look for evidence in the opposite direction. Whereas evolution deals in resemblances between different species, linkology emphasizes how the many parts work together to perform vital functions necessary for the well-being of the individual. Instead of being inter-specific like evolution, linkology is primarily intra-somatic. It draws attention to complementation which enables an individual to exist at all rather than bothering about competition which enables only the fittest individuals to survive.

## 2 DELVING INTO BASICS

Before examining some of the details about the adult stage of the Common Frog, it seems appropriate to delve into some basic questions prior to going into definitions of certain linkological concepts in the following main section of this article.

### 2.1 Observable linkage

A short list of useful questions to probe biological phenomena might well include the following:

- Why are the bodies of all known organisms made up of various parts?
- What causes each isolated part to be in itself made up of a set of sub-units (or components)?
- What exactly enables parts to become linked with others in order to work together?
- Do all sub-units belonging to the same set have equal status?
- What (if anything) is the relationship between structure and function?

Of course, one phenomenon lies behind each of the questions listed above. It is linkage. But a far more fundamental question to ask than linkage is to ask what lies behind it—"Why do links exist at all?"

### 2.2 Original lack

A wonderful insight into the problem of the need for linkage is provided by the account of the creation of Adam and Eve in Genesis chapter two. After reading through that account it becomes obvious that Adam was deliberately created to be 'not good . . . alone,' so that that first man could have a relationship of human companionship with part of himself formed into a separate entity. In other words, there would be no picture of organic life without the jig-saw puzzle piece fit of its component parts. So Eve was 'tailor-made' as a suitable helper for Adam, because the LORD God made him originally lacking.

Like the touch of King Midas that was reputed to turn everything into gold, so nothing within the compass of Biology is free from the effect of its created 'original lack.' What use is guanine without cytosine as molecular versions of Adam and Eve? Without linkage between those base pairs there could be no genetic code as we know it. Also without those paired bases becoming unlinked there would be no copying of the genetic code. And what use is the ability to encode without the simultaneous facility to decode? It is no wonder that, time after time, famous proponents of evolutionary thought frankly admit that they do not know how male and female came to exist in the first place. The union of sections loudly suggests deliberate planning.

## 3 DESCRIBING LINKOLOGICAL CONCEPTS

Ten concepts arise as an inter-related scheme from the fact that links and linkage exist throughout the whole range of biological phenomena. Also arising from concepts of linkage is a system of notation for levels of organisation as well as other consequences when entities become newly linked or unlinked.

### 3.1 Concepts considered

- Unitary incapacitation — no single entity is (fully) functional by itself. Always there is a sense in which an entity or part is 'not good . . . alone.' This is axiomatic. As such it stands as the basic fact of life.
- Reciprocal alleviation — only certain other entities can make an incapacitated entity fully functional. Through linkage between entities, potential functionality rises to become actual functionality.
- Integral encounters — whole entities come together in fixed ratios to alleviate each other's incapacitation. In their own right they are never fractions but are integral units.
- Heterogeneous composition — different entities become linked together to form a functional set. That is irrespective of the permanent or temporary nature of their linkage.
- Equivalent complementation—each constituent entity involved in linkage to form a functional set makes an equally valuable contribution to that set as any other entity.
- Periodic biostratification—each set can become linked with other sets to form an overall larger composite set, and so on, like the concatenation of 'Russian dolls.' See Table 1.
- Scalariform notation — owing to recurrent part-whole interrelationships involved in periodic biostratification, every entity in biology can be symbolised by a digit representing its relative position along a scale of linkages from 0 to 9.
- Anisogradal processes — changes in levels of periodic biostratification (and therefore also in scalariform notation) occur in many biological processes as well as in the life cycles of organisms. See Table 2 for a comparison of two different types of metabolic processes.
- Repercussional organisation — every part of an organism is composed of a multiplex of many component structures which coexist to contribute to many functions so that the whole is inter-

Table 1. Periodic Biostratification.

| Grade | Description         | Examples                    |
|-------|---------------------|-----------------------------|
| 9     | Habitat             | Marsh/pond                  |
| 8     | Society             | Swarm/stand                 |
| 7     | Body                | Frog/tadpole                |
| 6     | Organ               | Liver/heart                 |
| 5     | Pseudo-tissue       | Spirogyra/mushroom          |
| 4     | Cell                | Spawn/ <i>Amoeba</i>        |
| 3     | Organelle (plastid) | Mitochondrion/virus         |
| 2     | Macromolecule       | DNA/mucus/collagen          |
| 1     | Micromolecule       | Oxygen/water                |
| 0     | Energy              | Light/heat/gravity/electron |

Table 2. Anisogradal Processes.

| Inter-Related Changes               | Anabolism | Katabolism |
|-------------------------------------|-----------|------------|
| No. of linked entities              | increases | decreases  |
| Resultant energy level              | higher    | lower      |
| No. of resultant entities           | fewer     | more       |
| Size of resultant entities          | larger    | smaller    |
| Grade of periodic biostratification | rises     | falls      |

dependent. This concept is best represented by a linkogram or network. Figure 1 shows various ways in which the same number of entities may be arranged. Irrespective of the arrangement the following formulae apply:

$$L = E + S - G$$

and

$$\frac{L + G}{E + S} = 1.0$$

as well as

$$(L + G) - (E + S) = 0.0$$

where L is the number of links, E is the number of entities, S is the number of enclosed spaces and G is the number of groups.

- (10) Linkage rearrangement — occurs whenever organisms break down some links in order to obtain energy for making certain other linkages. Therefore, the physico-chemical basis of organic life depends upon the rearrangement of linkages. The reason for the phenomenon of unitary incapacitation is that it requires an entity to encounter another suitable entity, otherwise it cannot undergo linkage rearrangement. Ultimately this tenth concept summates all the

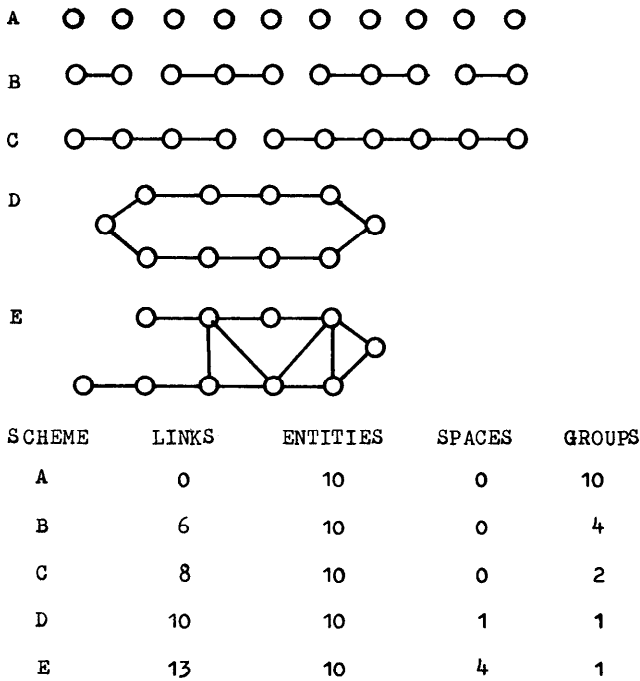


Figure 1. Entital arrangements.

other nine concepts to help discover that there is a relationship between structure and function. It may be expressed succinctly as follows:

FUNCTION IS STRUCTURE  
REARRANGED.

That is only so because

LINKAGE IS INVOLVED IN BOTH  
STRUCTURE AND FUNCTION.

3.2 Linkage levels

According to Table 1 a frog in a pond could be represented by its linkage levels as 7 in 9. Yet from another point of view it could also have been written as 7 in 1 because the bulk of the pond consists of water. But before anyone starts to get too quantitatively ambitious about the mathematics of scalariform notation, I should mention the fact that zeros cannot be multiplied, except to give zero as the product. The digits simply represent levels of linkage. However camouflage could well be shown as 7 = 9 and metamorphosis as 4 → 7 where zygote transforms into adult.

In Table 2 an example of an anabolic process is photosynthesis and respiration is an example of a katabolic process. A comparison of both processes in terms of their respective columns shows an interesting contrast between the build up of chemicals in the green plant for food and what is involved in tissue respiration during 'the breath of life.' In one sense Genesis chapter 1, verse 30 was giving early warning that photosynthesis and respiration would play opposite but complementary roles in the Carbon Cycle.

4 DEVISING A LINKOGRAM

When constructing a linkogram like the one shown in Figure 2, there is a procedure to follow before considering some of the parameters that arise.

4.1 Procedural steps

- (i) Consider the many structures, functions, substances and forces that interact within the twin environments of the adult Common Frog. Construct a Link List as in Table 3.
- (ii) Arrange the items mentioned in (i) as numbered entities so that no link crosses over any other link. Inevitably many drafts will be drawn.

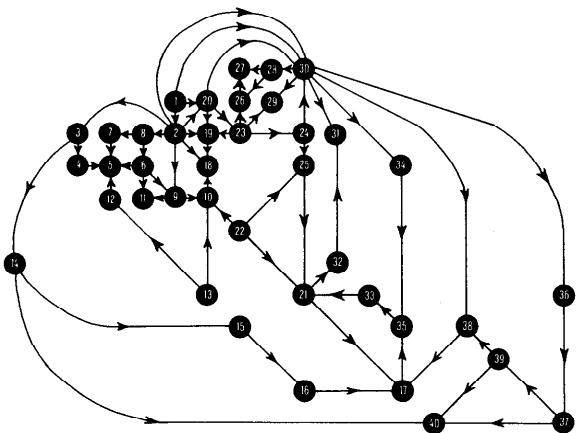


Figure 2. Linkogram of adult common frog *Rana temporaria*.

**Key to Linkogram of *Rana temporaria*  
(Common Frog)**

| Entity No. | Brief Description                               |
|------------|-------------------------------------------------|
| 1          | Air                                             |
| 2          | Tiny lungs                                      |
| 3          | No trachea                                      |
| 4          | No neck                                         |
| 5          | Undifferentiated vertebrae                      |
| 6          | No thorax                                       |
| 7          | No abdomen                                      |
| 8          | No diaphragm                                    |
| 9          | No ribs                                         |
| 10         | Pectoral girdle shields heart and absorbs shock |
| 11         | No rib muscles                                  |
| 12         | Urostyle                                        |
| 13         | Hind-legs for leaping                           |
| 14         | No larynx                                       |
| 15         | Glottal epithelial flaps                        |
| 16         | Vocal pouches                                   |
| 17         | Croak                                           |
| 18         | Single ventricle                                |

|    |                                             |
|----|---------------------------------------------|
| 19 | Atria receive oxygenated blood              |
| 20 | Cutaneous respiration                       |
| 21 | Amplexus                                    |
| 22 | Fore-limbs                                  |
| 23 | Highly vascular skin                        |
| 24 | Mucus                                       |
| 25 | Nuptial pads on males                       |
| 26 | Poikilothermy                               |
| 27 | Hibernation                                 |
| 28 | Low ambient temperature                     |
| 29 | Webbed feet                                 |
| 30 | Pond-water                                  |
| 31 | External fertilisation                      |
| 32 | Gamete release                              |
| 33 | Identification of opposite sex              |
| 34 | No external auditory meatus                 |
| 35 | Tympanic membrane on head surface           |
| 36 | No air under water                          |
| 37 | No need for a secondary palate              |
| 38 | Nostril closes                              |
| 39 | Vomerine teeth                              |
| 40 | Eye-balls are retractable to aid swallowing |

**Table 3. Link List.**

| From | To | Comment                                                                                                                                                                          |
|------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | 2  | Air being less dense than water would not allow frog to dive for cover if lungs were not small.                                                                                  |
| 1    | 20 | Air diffuses through skin to enter blood capillaries.                                                                                                                            |
| 1    | 30 | Specific gravity of water is much greater than that of air.                                                                                                                      |
| 2    | 3  | Tiny lungs are not only too puny to have a reinforced windpipe leading to them, but they are subsidiary to skin.                                                                 |
| 2    | 8  | Tiny lungs are too small to warrant a diaphragm to ventilate them.                                                                                                               |
| 2    | 9  | Tiny lungs are too small to warrant protection by ribs.                                                                                                                          |
| 2    | 18 | Blood from tiny lungs is not more oxygenated than blood from skin so there is no need for segregation by more than one ventricle.                                                |
| 2    | 19 | Atria receive blood equally oxygenated because skin is as efficient as a respiratory surface as tiny lungs.                                                                      |
| 2    | 20 | Tiny lungs need to have cutaneous respiration to augment their small oxygen intake.                                                                                              |
| 2    | 30 | The much greater density of water compared with air prevents frog from carrying large lung-full of air from pond surface to pond bottom.                                         |
| 3    | 4  | No point in having a neck if no trachea is present. (The eye-balls on top of head have good all-round vision so do not suffer by having no neck to turn head this way and that.) |
| 3    | 14 | No need to have larynx as an elaborate entrance to lungs if there is no trachea present.                                                                                         |
| 4    | 5  | No neck so no cervical vertebrae differentiation in upper trunk region of vertebral column.                                                                                      |
| 6    | 5  | No thorax so no thoracic vertebrae differentiation in upper mid region of vertebral column.                                                                                      |
| 6    | 9  | No thorax (and no thoracic vertebrae) so no ribs.                                                                                                                                |
| 6    | 11 | No need for intercostal muscles to ventilate thoracic cavity if no thorax and no ribs.                                                                                           |
| 7    | 5  | No abdomen so no lumbar vertebrae differentiation in lower mid region of vertebral column.                                                                                       |
| 8    | 6  | No diaphragm so no boundary in trunk to separate thorax from abdomen. Therefore, no thorax.                                                                                      |
| 8    | 7  | No diaphragm so no boundary in trunk to separate thorax from abdomen. Therefore, no abdomen.                                                                                     |
| 9    | 10 | No ribs to protect heart so pectoral girdle and sternum alone gives firm protection.                                                                                             |
| 9    | 11 | No ribs present so no need for muscles to move absent bones.                                                                                                                     |
| 10   | 18 | Pectoral girdle and sternum protect heart.                                                                                                                                       |
| 12   | 5  | Force of leap is transmitted via urostyle to series of undifferentiated vertebrae.                                                                                               |
| 13   | 10 | After jumping with hind-limbs, pectoral girdle absorbs shock of landing on hard ground.                                                                                          |
| 13   | 12 | Hind-limbs transmit thrust to urostyle during leaping.                                                                                                                           |
| 14   | 15 | No proper larynx means that vocal cords are reduced to glottal epithelial flaps.                                                                                                 |
| 14   | 40 | No larynx means that swallowing must therefore be performed by muscles pulling eyeballs into head to push food in oesophagus (gullet).                                           |
| 15   | 16 | Having only tiny glottal epithelial flaps means that vocal pouch is needed to generate or resonate croak.                                                                        |
| 16   | 17 | Vocal pouch helps to transmit sound of croak over a fair distance.                                                                                                               |
| 17   | 35 | Frog needs to hear croaks of other frogs so it needs an ear-drum.                                                                                                                |
| 19   | 18 | Owing to atria receiving equally oxygenated blood from skin and tiny lungs they need not pass it on to two ventricles as it does not require segregation.                        |
| 20   | 19 | Skin respiration causes blood leaving skin to be as oxygenated as blood leaving tiny lungs.                                                                                      |
| 20   | 23 | Skin respiration is possible because that organ is richly supplied with blood vessels.                                                                                           |

|    |    |                                                                                                                                                         |
|----|----|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20 | 30 | Oxygen dissolved in water can diffuse into skin both when frog is in the pond and when frog is on dry land provided that its skin remains moist.        |
| 21 | 17 | If male is grabbed by another male by mistake, the caught partner will emit a croak by the pressure of the grip upon its trunk.                         |
| 21 | 32 | Squeezing trunk of caught partner helps both mating frogs to synchronise gamete release.                                                                |
| 22 | 10 | Fore-limbs transmit shock waves to pectoral girdle upon landing on ground.                                                                              |
| 22 | 21 | Fore-limbs grip partner during mating.                                                                                                                  |
| 22 | 25 | Nuptial pads on male prevent slipping whilst gripping mate.                                                                                             |
| 23 | 19 | Rich blood supply to skin ensures that oxygen diffuses into frog.                                                                                       |
| 23 | 24 | Mucus on skin acts like phlegm to prevent copious water loss and enhance oxygen intake through moist surface.                                           |
| 23 | 26 | Having rich blood supply to skin means that in cold weather the frog suffers from hypothermia.                                                          |
| 23 | 29 | Webbed feet enable frog in water to have increased surface area for oxygen intake.                                                                      |
| 24 | 25 | Slimy skin necessitates males gripping females by means of nuptial pads to avoid slipping their grip.                                                   |
| 24 | 30 | Slime traps water as it diffuses out of skin through the same pores that oxygen diffuses inwards.                                                       |
| 25 | 21 | Males develop nuptial pads in breeding season for gripping partner during mating.                                                                       |
| 26 | 27 | Being cold-blooded the frog suffers a fall in its metabolic rate and so needs to go into hibernation.                                                   |
| 28 | 26 | Richly vascular skin which is also moist results in rapid heat loss to cold surroundings so frog is forced to be cold-blooded rather than warm-blooded. |
| 28 | 27 | Metabolic rate is greatly reduced in very cold weather so frog is forced to hibernate or die.                                                           |
| 30 | 28 | Water when it evaporates takes a lot of heat from surface of frog's skin.                                                                               |
| 30 | 29 | Webbed skin between toes of hind-limb helps frog to have efficient propulsion in water.                                                                 |
| 30 | 31 | Water is the external medium in which sperms meet eggs.                                                                                                 |
| 30 | 34 | Frogs would become deaf if water entered their ear-holes so they have no external auditory meatus on their heads.                                       |
| 30 | 36 | When a frog catches food under water there is no air to take into its body when opening its mouth and nostrils.                                         |
| 30 | 38 | When not eating, nostril valves keep water out of mouth during a dive.                                                                                  |
| 32 | 31 | Gamete release must precede external fertilisation.                                                                                                     |
| 33 | 21 | Croak of male attracts female to him, but accidentally squeezing another male in the dark produces another croak from the one being squeezed.           |
| 34 | 35 | Ear-drum lying next to skin of head avoids the need to have an ear-hole.                                                                                |
| 35 | 33 | A frog can recognize a male frog by its croak.                                                                                                          |
| 36 | 37 | As there is no air below pond surface when frog feeds in water, then there is no need for a secondary palate.                                           |
| 37 | 39 | Vomerine may catch on to struggling prey and this is possible because there is no secondary palate.                                                     |
| 37 | 40 | No eye-socket bones and no secondary palate allow eyeballs to be retracted by muscles and so help push food into oesophagus (gullet).                   |
| 38 | 17 | Valves in nostrils help frog to develop buccal pressure for croak (at least in males).                                                                  |
| 39 | 38 | Any live prey trying to escape via nostril valves will probably become caught by vomerine teeth.                                                        |
| 39 | 40 | Eye-balls pushed by muscles cause live prey to enter oesophagus (gullet).                                                                               |

TOTAL = 65

- (iii) Decide to stop when the scheme is in danger of filling up with criss-cross links and try to space out entities so that their final arrangement looks pleasing to the eye.
- (iv) Check over the final version of the linkogram in case one entity has become omitted. Then note the final number of entities.
- (v) Count the number of links in the linkogram. Here the first formula or equation mentioned in the Ninth Concept within section 3.1 of this article should help to double check the total number of links.
- (vi) Finally decide upon the function or couple of functions to which each entity principally may be ascribed. These may be represented as in Figure 3 which is optional, but their inclusion in the final column of Table 4 is obligatory.

#### 4.2 Some parameters

When the details of the linkogram are set out as shown in Table 3, each entity is found to have the following fundamental parameters:

- (a) Valency. This is the total number of links in contact with a particular entity, irrespective of the direction in which they are pointing.

- (b) Polarity. This takes into account the direction in which particular links are pointing. Those links pointing towards an entity under consideration are entered in the column headed 'IN.' Similarly, those links pointing away from an entity under consideration are entered in the column headed 'OUT.'

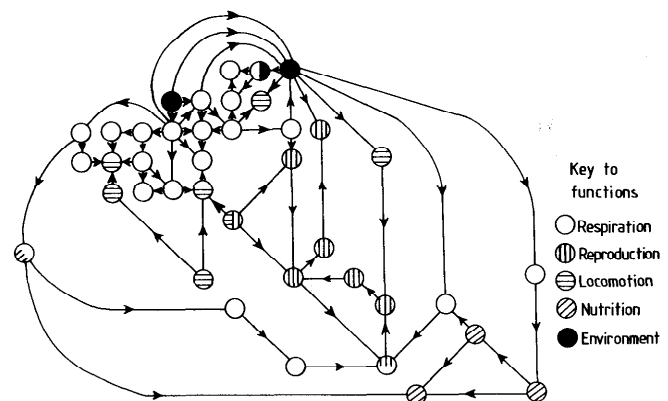


Figure 3. Linkogram of *Rana temporaria* showing functional ascription.

(c) Fluency. This is an arithmetical value which expresses the difference between the number of 'IN' arrows regarded as positive and the number of 'OUT' arrows as negative. Incidentally, the outflow is negative only with respect to a particular entity. In reality such negativity really amounts to a positive contribution made by that particular entity to the overall scheme expressed as the linkogram. After all entities have had their fluency entered into Table 4, then look for the

entity having the greatest negative fluency and then write the value '1' in the next column headed 'Seriality.' Figure 4 shows how fluency calibrated on the left vertical axis converts into seriality calibrated on the right vertical axis.

(d) Seriality. The relationship between fluency and seriality was described in (c) above. Now it only remains to explain two ways in which the parameter of seriality is more useful than the parameter of fluency. One way is

Table 4. A Linkological Evaluation of *Rana temporaria*.

| Ref. No. | Entities<br>Brief Description  | Linkage |          |   |         |           |               |                 | Function   |
|----------|--------------------------------|---------|----------|---|---------|-----------|---------------|-----------------|------------|
|          |                                | Valency | Polarity |   | Fluency | Seriality | Retro-fluency | Retro-seriality |            |
| 1        | Air                            | 3       | 0        | 3 | -3      | 4         | +3            | 8               | Env.       |
| 2        | Tiny lungs                     | 8       | 1        | 7 | -6      | 1         | +6            | 11              | Resp.      |
| 3        | No trachea                     | 3       | 1        | 2 | -1      | 6         | +1            | 6               | Resp.      |
| 4        | No neck                        | 2       | 1        | 1 | 0       | 7         | 0             | 5               | Resp.      |
| 5        | Undifferentiated vertebrae     | 4       | 4        | 0 | +4      | 11        | -4            | 1               | Resp/Loco. |
| 6        | No thorax                      | 4       | 1        | 3 | -2      | 5         | +2            | 7               | Resp.      |
| 7        | No abdomen                     | 2       | 1        | 1 | 0       | 7         | 0             | 5               | Resp.      |
| 8        | No diaphragm                   | 3       | 1        | 2 | -1      | 6         | +1            | 6               | Resp.      |
| 9        | No ribs                        | 4       | 2        | 2 | 0       | 7         | 0             | 5               | Resp.      |
| 10       | Pectoral girdle                | 4       | 3        | 1 | +2      | 9         | -2            | 3               | Resp/Loco. |
| 11       | No intercostal muscles         | 2       | 2        | 0 | +2      | 9         | -2            | 3               | Resp.      |
| 12       | Urostyle                       | 2       | 1        | 1 | 0       | 7         | 0             | 5               | Loco.      |
| 13       | Hind-legs                      | 2       | 0        | 2 | -2      | 5         | +2            | 7               | Loco.      |
| 14       | No larynx                      | 3       | 1        | 2 | -1      | 6         | +1            | 6               | Resp/Nut.  |
| 15       | Glottal epithelial flaps       | 2       | 1        | 1 | 0       | 7         | 0             | 5               | Resp.      |
| 16       | Vocal pouches                  | 2       | 1        | 1 | 0       | 7         | 0             | 5               | Resp.      |
| 17       | Croak                          | 4       | 3        | 1 | +2      | 9         | -2            | 3               | Resp/Repr. |
| 18       | Single ventricle               | 3       | 3        | 0 | +3      | 10        | -3            | 2               | Resp.      |
| 19       | Atria receive oxygenated blood | 4       | 3        | 1 | +2      | 9         | -2            | 3               | Resp.      |
| 20       | Cutaneous respiration          | 5       | 2        | 3 | -1      | 6         | +1            | 6               | Resp.      |
| 21       | Amplexus                       | 5       | 3        | 2 | +1      | 8         | -1            | 4               | Repro.     |
| 22       | Fore-limbs                     | 3       | 0        | 3 | -3      | 4         | +3            | 8               | Repr/Loco. |
| 23       | Highly vascular skin           | 5       | 1        | 4 | -3      | 4         | +3            | 8               | Resp.      |
| 24       | Mucus                          | 3       | 1        | 2 | -1      | 6         | +1            | 6               | Resp.      |
| 25       | Nuptial pads on males          | 3       | 2        | 1 | +1      | 8         | -1            | 4               | Repro.     |
| 26       | Poikilothermy                  | 3       | 2        | 1 | +1      | 8         | -1            | 4               | Resp.      |
| 27       | Hibernation                    | 2       | 2        | 0 | +2      | 9         | -2            | 3               | Resp.      |
| 28       | Low ambient temperature        | 3       | 1        | 2 | -1      | 6         | +1            | 6               | Env/Resp.  |
| 29       | Webbed feet                    | 2       | 2        | 0 | +2      | 9         | -2            | 3               | Loco.      |
| 30       | Water                          | 10      | 4        | 6 | -2      | 5         | +2            | 7               | Env.       |
| 31       | External fertilization         | 2       | 2        | 0 | +2      | 9         | -2            | 3               | Repro.     |
| 32       | Gamete release                 | 2       | 1        | 1 | 0       | 7         | 0             | 5               | Repro.     |
| 33       | Identifies opposite sex        | 2       | 1        | 1 | 0       | 7         | 0             | 5               | Repro.     |
| 34       | No external auditory meatus    | 2       | 1        | 1 | 0       | 7         | 0             | 5               | Loco.      |
| 35       | Tympanic membrane on head skin | 3       | 2        | 1 | +1      | 8         | -1            | 4               | Repro.     |
| 36       | No air under water             | 2       | 1        | 1 | 0       | 7         | 0             | 5               | Resp.      |
| 37       | No need for a secondary palate | 3       | 1        | 2 | -1      | 6         | +1            | 6               | Nut.       |
| 38       | Nostril valve                  | 3       | 2        | 1 | +1      | 8         | -1            | 4               | Resp.      |
| 39       | Vomerine teeth                 | 3       | 1        | 2 | -1      | 6         | +1            | 6               | Nut.       |
| 40       | Eye-balls retract              | 3       | 3        | 0 | +3      | 10        | -3            | 2               | Nut.       |

when an entity having a fluency rating of zero needs to be shown as being worth one more than another entity having a fluency rating of minus one. Another way is when calculating the functional complementation for the entities within a linkogram. Although the procedure is explained in more detail in (h) below, it does involve multiplying the number of entities having the same function by their seriality because if their fluency were to be multiplied, then any entity having a fluency of zero would inevitably make the product of that sum also come to zero. But a glance at Figure 4 will show that any entity of fluency zero is rated as having a seriality of 7.

- (e) Functionality. Each entity is ascribed as supporting a particular function. In any case when an entity supports many functions then only the principal two are recorded in the final column in Table 4, as was mentioned in (vi) of section 4.1 of this article.
- (f) Totals. Some important relationships become apparent when the columns in Table 4 are added up. The value of the total valency is exactly twice that of each of the polarity column totals. Also the number of 'IN' links should equal the number of 'OUT' links when those columns are added. Equally obvious is the fact that the total number of fluency values should be zero because the negative values exactly cancel out the positive values. Finally, the total seriality equals 280 and when divided by the number of entities (forty) gives the quotient 7.
- (g) Termini. When the entities are arranged along the line of the linkogram shown in Figure 4 in order of diminishing fluency (and seriality), they form a sigmoid curve in this particular case. Entity number 5 appears first because it has a fluency of +4 (= seriality of 11) and entity number 2 has the least fluency of -6 (= seriality of only 1). Such extreme entities are termed termini. At this stage it would be inappropriate and ambiguous to identify which was the 'source' entity and which was the 'sink' entity. Let it suffice to call them termini.

(h) Functional complementation. This derived pa-

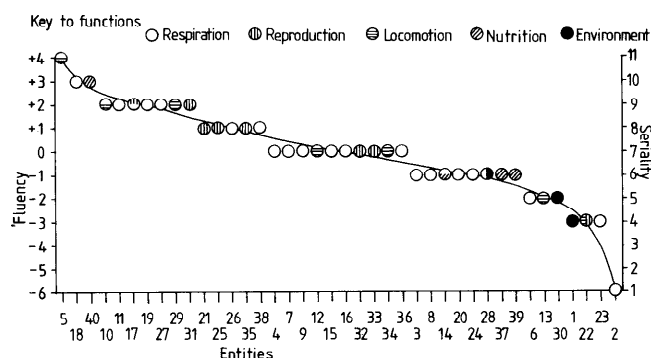


Figure 4. Linkogram of *Rana temporaria* showing flow from source to sink.

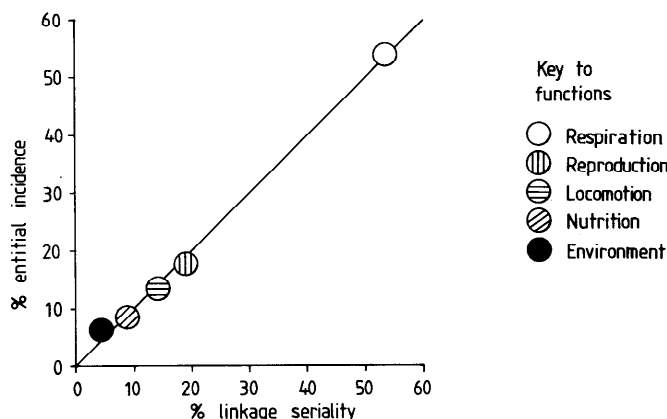


Figure 5. Plot of functional complementation expressed within *Rana temporaria* linkogram.

rameter is based upon two co-ordinate values. One is the 'entital incidence' which is the total number of entities having the same functional ascription. (Incidentally, those entities sharing two functions count as half per function.) The other co-ordinate is the 'linkage seriality,' which is simply the total seriality value of the entities having the same functional ascription. When those two values are turned into percentages and plotted as shown in Figure 5 there is a high degree of positive correlation between them. A glance at Table 5 will show how the data included in Table 6 were obtained. An examination of the percentages in each column along the rows labelled entitality and seriality reveals that both parameters are within 2% of each other per function.

- (i) Retrofluency. As already mentioned in (c) above, the output from an entity is really a contribution to the whole linkogram scheme representing the organism. Therefore, when the 'OUT' links are viewed as positive, simply change the arithmetical sign of the fluency rating to transform it into the retrofluency rating.
- (j) Retroseriality. In terms of retrofluency, the entity having the most negative rating will be given a retroseriality rating of one. Also the entity with the most positive retrofluency will have the greatest retroseriality. In effect the conversion from fluency to retrofluency and from seriality to retroseriality means that at a stroke the highest entity on the linkogram becomes the lowest entity afterwards and what was the lowest becomes the highest. So the mathematical notions of 'source' and 'sink' become transposed. Therefore, in (g) above it was reckoned best to simply term them 'termini.'

In addition to the fundamental parameters described in (a) to (j) above, others exist as derivations from them. Figure 6 shows a tree-like scheme of those linkological parameters which play some part in evaluating the design linkage exhibited by the plan of the adult Common Frog. The concept of incoming seriality and out-

Table 5. Complementation.

|                     | Ent. No. | Val. | In  | Out | Ser. | Serin. | Sereff. | R/ser. | R/in. | R/eff. |
|---------------------|----------|------|-----|-----|------|--------|---------|--------|-------|--------|
| <b>RESPIRATION</b>  |          |      |     |     |      |        |         |        |       |        |
|                     | 2        | 8    | 1   | 7   | 1    | 4      | 49      | 11     | 8     | 35     |
|                     | 3        | 3    | 1   | 2   | 6    | 1      | 13      | 6      | 11    | 11     |
|                     | 4        | 2    | 1   | 1   | 7    | 6      | 11      | 5      | 6     | 1      |
|                     | 5*       | 2    | 2   | 0   | 5½   | 13     | 0       | ½      | 11    | 0      |
|                     | 6        | 4    | 1   | 3   | 5    | 6      | 27      | 7      | 6     | 9      |
|                     | 7        | 2    | 1   | 1   | 7    | 6      | 11      | 5      | 6     | 1      |
|                     | 8        | 3    | 1   | 2   | 6    | 1      | 12      | 6      | 11    | 12     |
|                     | 9        | 4    | 2   | 2   | 7    | 6      | 18      | 5      | 18    | 6      |
|                     | 10*      | 2    | 1½  | ½   | 4½   | 8      | 5       | 1½     | 10    | 1      |
|                     | 11       | 2    | 2   | 0   | 9    | 12     | 0       | 3      | 12    | 0      |
|                     | 14*      | 1½   | ½   | 1   | 3    | 3      | 8½      | 3      | 3     | 3½     |
|                     | 15       | 2    | 1   | 1   | 7    | 6      | 7       | 5      | 6     | 5      |
|                     | 16       | 2    | 1   | 1   | 7    | 7      | 9       | 5      | 5     | 3      |
|                     | 17*      | 2    | 1½  | ½   | 4½   | 11½    | 4       | 1½     | 6½    | 2      |
|                     | 18       | 3    | 3   | 0   | 10   | 19     | 0       | 2      | 17    | 0      |
|                     | 19       | 4    | 3   | 1   | 9    | 11     | 10      | 3      | 25    | 2      |
|                     | 20       | 5    | 2   | 3   | 6    | 5      | 18      | 6      | 19    | 18     |
|                     | 23       | 5    | 1   | 4   | 4    | 6      | 32      | 8      | 6     | 16     |
|                     | 24       | 3    | 1   | 2   | 6    | 4      | 13      | 6      | 8     | 11     |
|                     | 26       | 3    | 2   | 1   | 8    | 10     | 9       | 4      | 14    | 3      |
|                     | 27       | 2    | 2   | 0   | 9    | 14     | 0       | 3      | 10    | 0      |
|                     | 28*      | 1½   | ½   | 1   | 3    | 2½     | 8½      | 3      | 3½    | 3½     |
|                     | 36       | 2    | 1   | 1   | 7    | 5      | 6       | 5      | 7     | 6      |
|                     | 38       | 3    | 2   | 1   | 8    | 11     | 9       | 4      | 13    | 3      |
| Totals              | 21½      | 71   | 35  | 36  | 149½ | 178    | 280     | 108½   | 242   | 152    |
| <b>REPRODUCTION</b> |          |      |     |     |      |        |         |        |       |        |
|                     | 17*      | 2    | 1½  | ½   | 4½   | 11½    | 4       | 1½     | 6½    | 2      |
|                     | 21       | 5    | 3   | 2   | 8    | 19     | 16      | 4      | 17    | 8      |
|                     | 22*      | 1½   | 0   | 1½  | 2    | 0      | 12½     | 3½     | 0     | 5½     |
|                     | 25       | 3    | 2   | 1   | 8    | 10     | 8       | 5      | 14    | 4      |
|                     | 31       | 2    | 2   | 0   | 9    | 12     | 0       | 3      | 12    | 0      |
|                     | 32       | 2    | 1   | 1   | 7    | 8      | 9       | 5      | 4     | 3      |
|                     | 33       | 2    | 1   | 1   | 7    | 8      | 8       | 5      | 4     | 4      |
|                     | 35       | 3    | 2   | 1   | 8    | 16     | 7       | 4      | 8     | 5      |
| Totals              | 7        | 20½  | 12½ | 8   | 53½  | 84½    | 64½     | 31     | 65½   | 31½    |
| <b>LOCOMOTION</b>   |          |      |     |     |      |        |         |        |       |        |
|                     | 5*       | 2    | 2   | 0   | 5½   | 13     | 0       | ½      | 11    | 0      |
|                     | 10*      | 2    | 1½  | ½   | 4½   | 8      | 5       | 1½     | 10    | 1      |
|                     | 12       | 2    | 1   | 1   | 7    | 5      | 11      | 5      | 7     | 1      |
|                     | 13       | 2    | 0   | 2   | 5    | 0      | 16      | 7      | 0     | 8      |
|                     | 22*      | 1½   | 0   | 1½  | 2    | 0      | 12½     | 3½     | 0     | 5½     |
|                     | 29       | 2    | 2   | 0   | 9    | 9      | 0       | 3      | 15    | 0      |
|                     | 34       | 2    | 1   | 1   | 7    | 5      | 8       | 5      | 7     | 4      |
| Totals              | 5½       | 13½  | 7½  | 6   | 40   | 40     | 52½     | 25½    | 50    | 19½    |
| <b>NUTRITION</b>    |          |      |     |     |      |        |         |        |       |        |
|                     | 14*      | 1½   | ½   | 1   | 3    | 3      | 8½      | 3      | 3     | 3½     |
|                     | 37       | 3    | 1   | 2   | 6    | 7      | 16      | 6      | 5     | 8      |
|                     | 39       | 3    | 1   | 2   | 6    | 6      | 18      | 6      | 6     | 6      |
|                     | 40       | 3    | 3   | 0   | 10   | 18     | 0       | 2      | 18    | 0      |
| Totals              | 3½       | 10½  | 5½  | 5   | 25   | 34     | 42½     | 17     | 32    | 17½    |
| <b>ENVIRONMENT</b>  |          |      |     |     |      |        |         |        |       |        |
|                     | 1        | 3    | 0   | 3   | 4    | 0      | 12      | 8      | 0     | 24     |
|                     | 28*      | 1½   | ½   | 1   | 3    | 2½     | 8½      | 3      | 3½    | 3½     |
|                     | 30       | 10   | 4   | 6   | 5    | 17     | 46      | 7      | 31    | 26     |
| Totals              | 2½       | 14½  | 4½  | 10  | 12   | 19½    | 66½     | 18     | 34½   | 53½    |
| GRAND TOTALS        | 40       | 130  | 65  | 65  | 280  | 356    | 506     | 200    | 424   | 274    |

\*Denotes an entity ascribed to two functions so only half values have been shown per line.

Table 6. Parametrical Analysis of Functions.

| Symbols | Parameters               | Functions          |       |                     |       |                   |       |                  |      |                    |       |
|---------|--------------------------|--------------------|-------|---------------------|-------|-------------------|-------|------------------|------|--------------------|-------|
|         |                          | Respiration<br>No. | %     | Reproduction<br>No. | %     | Locomotion<br>No. | %     | Nutrition<br>No. | %    | Environment<br>No. | %     |
| e       | ENTITIALITY<br>(40)      | 21½                | 53.75 | 7                   | 17.50 | 5½                | 13.75 | 3½               | 8.75 | 2½                 | 6.25  |
| Pn      | ENDOPOLARITY<br>(65)     | 35                 | 53.85 | 12½                 | 19.23 | 7½                | 11.54 | 5½               | 8.46 | 4½                 | 6.92  |
| Px      | ECTOPOLARITY<br>(65)     | 36                 | 55.38 | 8                   | 12.31 | 6                 | 9.23  | 5                | 7.69 | 10                 | 15.38 |
| v       | VALENCY<br>(130)         | 71                 | 54.62 | 20½                 | 15.77 | 13½               | 10.38 | 10½              | 8.08 | 14½                | 11.15 |
| r       | RETRO-SERIALITY<br>(200) | 108½               | 54.25 | 31                  | 15.5  | 25½               | 12.75 | 17               | 8.5  | 18                 | 9.0   |
| re      | RETROEFFLUX<br>(274)     | 152                | 55.47 | 31½                 | 11.5  | 19½               | 7.12  | 17½              | 6.39 | 53½                | 19.52 |
| s       | SERIALITY<br>(280)       | 149½               | 53.39 | 53½                 | 19.11 | 40                | 14.28 | 25               | 8.93 | 12                 | 4.29  |
| si      | SERINFLUX<br>(356)       | 178                | 50.0  | 84½                 | 23.73 | 40                | 11.24 | 34               | 9.55 | 19½                | 5.48  |
| ri      | RETROINFLUX<br>(424)     | 242                | 57.07 | 65½                 | 15.45 | 50                | 11.79 | 32               | 7.55 | 34½                | 8.14  |
| se      | SEREFFLUX<br>(506)       | 280                | 55.34 | 64½                 | 12.75 | 52½               | 10.38 | 42½              | 8.4  | 66½                | 13.14 |
| re      | RETROCOFLUX<br>(698)     | 394                | 56.44 | 97                  | 13.9  | 69½               | 9.96  | 49½              | 7.09 | 88                 | 12.61 |
| se      | SERCOFLUX<br>(862)       | 458                | 53.13 | 149                 | 17.29 | 92½               | 10.73 | 76½              | 8.87 | 86                 | 9.98  |

going seriality is carried a step further. With respect to each entity those incoming links are rated with the seriality of the entities they sprang from. That is termed serinflux. The 65 incoming links add up to a total of 356. Conversely the 65 outgoing links connect with other entities having a total of 506, which is termed serefflux. The combined total of serinflux and serefflux is termed sercoflux. Similarly the terms retroinflux, retroefflux and retrocoflux apply to the retroseriality ratings of the entities concerned. (Incidentally, the combined values of sercoflux and retrocoflux add up to a sum termed the 'toticoflux,' which, when divided by the valency, always gives an answer that is the sum of the zero fluency in terms of seriality and the zero retrofluency in terms of retroseriality. So even the toticoflux per function divided by the valency per function will give the same quotient referred to in the previous sentence).

Figure 7 shows eleven of the twelve parameters listed in Table 6. The line code for each function plotted is different to distinguish one function from another. Only endopolarity was omitted in order to aid clarity because it plotted at the same distance along the x-axis as ectopolarity.

Finally, in this section of the article some attention should be paid to the cluster of parameters near the top of Figure 6. The parameters stem from valency. Adjacency is simply the number of entities within the linkogram that are in juxtaposition having links connecting them. They amount to 65. Entlink is found by adding up all cases where entities have links one with another. It is a total of incidence at positions in an array such as a table and in this case amounted to 287.

Link represented 'link connectivity by the shortest possible path' within the linkogram between each entity and all other entities to which connection is possible. Its value came to 816. Then route multiplicity was a consideration of the many ways in which a path existed between each entity and all other entities with which it has connections. Tracing out countless routes on a 'light-table' was very tedious and most prone to inaccuracies. So when I made the score 532, I expect to be corrected in the future. Very roughly 532 is almost equal to the difference between 816 & 287. Therefore, one day a more elaborate relationship may be found, but in the meantime, it seems a good rule of thumb to suggest that ROUTE MULTIPLICITY is approximately equal to LINK CONNECTIVITY minus ENTLINK.

##### 5 DESTINATIONS WITHIN THE LINKOGRAM

The linkogram of the adult Common Frog, shown in Figure 2, contains a number of routes that end in entities having positive fluency. These entities may be regarded as 'destinations' or target entities within the linkogram scheme. All the examples described in this main section of the article arise from the same common origin. That origin is not a primitive fossil ancestor to the frog, but rather it is a present functioning structure—namely, the tiny (paired) lungs (entity number 2). From that entity (2) may be derived the many specialised adult frog features that interact in a consequential manner. They result in a network exhibiting multiplexual reciprocal alleviations. Such 'design-linkage' was expressed by St. Paul in Ephesians chapter 4, verse 16 as follows:

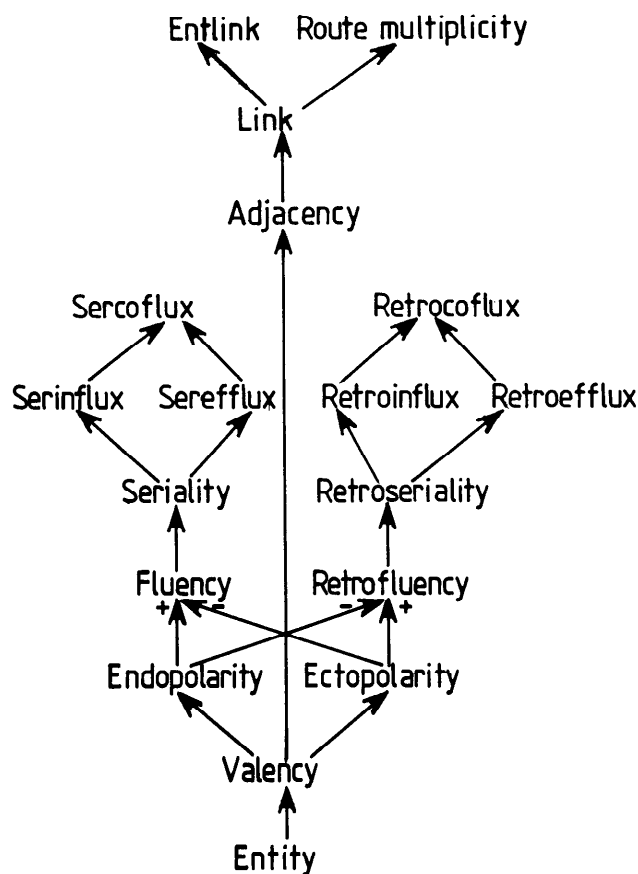


Figure 6. A parametrical 'phylogeny.'

"... THE WHOLE BODY FITLY JOINED TOGETHER AND COMPACTED BY THAT WHICH EVERY JOINT SUPPLIETH, ACCORDING TO THE EFFECTUAL WORKING IN THE MEASURE OF EVERY PART ..."

### 5.1 Single ventricle

(The numbers in the parentheses are not references, as is common; they refer to the entities in the linkograms, as already mentioned.)

Because air (1) has a density that is considerably less than that of water (30), the adult frog would have to expend a lot of energy if it tried to dive to the bottom of the pond whilst carrying lungfuls of air. Such organs would inevitably act as internal 'water-wings' to keep the frog at the pond surface. So the frog only has lungs that are tiny (2). By themselves such puny organs are unable to cope with the respiratory requirements of the frog.

Clearly, such tiny lungs, although good for diving, are 'not good ... alone' for helping the frog to breathe. Consequently, another surface must exist for the purpose of gaseous exchange in order to enrich the oxygen content of the blood and remove its carbon dioxide. Hence, the skin has been commandeered to perform cutaneous respiration (20). But to work efficiently the skin must have a rich blood supply and, in fact, it is highly vascular (23).

Of course, having skin that is also a respiratory organ in addition to its many other functions has several repercussions. One of those is that the blood from the skin is oxygenated to about the same extent as that from the lungs. Therefore, the frog's heart atria receive oxygenated blood (19). So there is no need to segregate the blood from each source into separate ventricles. Consequently, unlike our own heart, which has one ventricle for oxygenated blood and another one for de-oxygenated blood, the frog's heart has but a single ventricle (18).

As though travelling along a rail network we have journeyed from the main-line terminus to which I am likening entity (2), through stations such as entities (20), (23) and (19) in order to arrive at our destination which is, in this case, entity (18).

### 5.2 Similar vertebrae

Cutaneous respiration (20) enables the adult frog to cope with breathing without having to rely much upon its tiny lungs (2). So there is no necessity for the frog to keep its air-way open by means of a windpipe reinforced with incomplete rings of cartilage. Consequently, the frog has no trachea (3). As a repercussion of that the frog has no proper neck (4) and, therefore, does not need to have its upper trunk vertebrae differentiated into a cervical region.

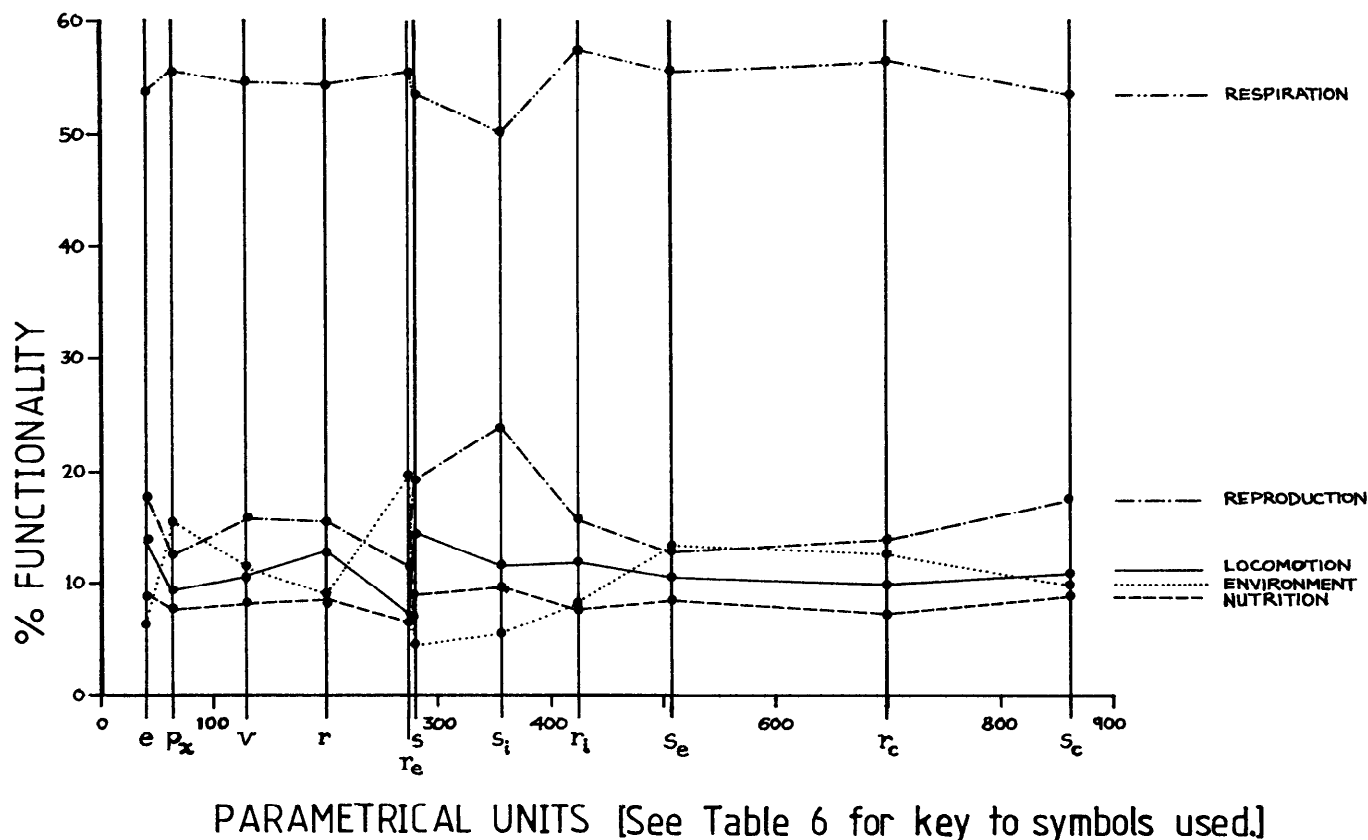
Another repercussion of having tiny lungs (2) is that they are hardly worth protecting with ribs so there are no ribs (9). Neither are there any intercostal muscles (11) nor diaphragm (8) to help ventilate the tiny lungs. So in having no ribs to articulate with trunk vertebrae means that there is no thoracic region of its 'backbone.' Also, owing to the absence of a diaphragm (8), which acts as a boundary between chest and belly, there is, strictly speaking, no thorax (6) and no abdomen (7). (Incidentally, the so-called 'anterior abdominal vein' should, therefore, be renamed 'anterior lower trunk vein'.)

Owing to there being no proper abdomen (7) then there is no over-riding need for the frog's vertebral column to be differentiated into lumbar and sacral regions. In such a way our own route has brought us to the destination of the frog having undifferentiated vertebrae (5). However, that is not to say that an expert could not distinguish between one trunk vertebra and another or that the last one does not have well-developed transverse processes for articulation with the ilia.

A study of Figure 2 will reveal that the journey from the mainline terminus (namely, entity number 2) to the destination of undifferentiated or similar vertebrae (namely, entity number 5) could have taken a variety of routes. One route is via entities (3) and (4). Another route is via entities (8) and (6). Yet a third route is via entities (8) and (7).

### 5.3 Submerged hibernation

Owing to the by now familiar link between tiny lungs (2) and cutaneous respiration (20) having gaseous exchange enhanced owing to the frog's skin being highly vascular (23), there is an inevitable consequence in cold weather. It is that the frog loses heat rapidly from its body when ambient temperature becomes low

Figure 7. *Rana temporaria* linkogram evaluation.

(28). Although the frog is poikilothermic (i.e., 'cold-blooded') (26) it soon loses any metabolically generated heat to the surrounding pond-water. The small size of the frog's body aggravates its predicament by giving it a high surface area to volume ratio, and the result is that activity becomes much slower as winter approaches. Eventually the frog buries into the pond bottom to hibernate (27). Only when the pond-water becomes warmer in spring-time will the frog awaken from its torpor.

Two routes exist between tiny lungs (2) and hibernation (27). One is via entities (23) and (26) and the alternative is via entities (20), (30) and (28).

#### 5.4 Successful breeding

The presence of mucus on the skin of the frog helps to enhance cutaneous respiration in much the same way as phlegm in the lung operates. But it prevents breeding partners from holding on to each other. That problem is remedied by the male having a nuptial pad (25) to help him to retain his grip on the female during amplexus (21). Together the partners release their gametes (32) into the pond-water where external fertilization (31) can occur. But in the event of the male losing his grip on the female, their bodies would be

further apart and so reduce the chance of a sperm entering an egg before the jelly formed over the spawn.

Before any amplexus can occur, the male frog must attract a female. Even in the darkest night, his croak (17) can be heard by other frogs. Not only must the female hear the croak of the male, but also the male must be able to hear the splash as the female enters the pond-water. Clearly, if water got into frogs' ear-holes they would become deafened and not be able to home in towards each other in the dark. Therefore, the frog has no external auditory meatus (34) for water to enter, so its hearing is not impaired. Instead, the frog has its ear drum close against the skin of its head (35) and as only the male croaks, one male would soon know if he accidentally squeezed the trunk of another male in the dark! That explains the link between entity (21) and entities (35) and (33).

#### 5.5 Sinking eyeballs

In section 5.2 it was mentioned that tiny lungs (2) inevitably gave rise to there being no trachea (3) and so the larynx is largely absent (14). Not only does the frog need vocal pouches (16) to enhance the vibrations of its glottal epithelial flaps (15) and so croak if it is

male, but not having a proper larynx leads to another complication. How can the frog swallow? In our bodies the larynx rises when we swallow for two reasons. One is to block off the glottis, which is the entrance leading to the windpipe, and so stop food entering our lungs. The other is to come down after rising in order for the larynx to initiate the swallowing reflex.

In the case of the frog, instead of the larynx pushing food down its gullet or oesophagus, muscles retract the eyeballs to help push food down during swallowing (40). However, the eyeballs can only sink because the frog has no floor to its eye-socket in its skull and also has no secondary palate (37) which would act to prevent eyeball pressure upon food. Also, its not having a secondary palate could mean that any prey could try to escape from the mouth cavity via the nostrils. To prevent such a thing happening, the frog has vomerine teeth (39) and nostril valves (38) to contain its food, even though no teeth exist in the jaws to cut food into pieces. Furthermore, there is no air under the water, so a frog feeding below the pond surface would not benefit from having a nasal cavity kept separate from its buccal cavity by a secondary palate. That is the reason for the inclusion of entity number (36) in the linkogram shown in Figure 2.

### 5.6 Shock absorbing

In section 5.2 the linkage leading from the tiny lungs (2) through to there being no ribs (9) in the frog was described. Having no ribs (9) means that there is no protection for the upper trunk organs. Although the lungs are puny and do not need special protection, the heart exists and merits skeletal cover. Entities (18) and (19) represent the heart in Figure 2. Therefore, the pectoral girdle is extensively present in the frog to compensate for the lack of ribs. So having a pectoral girdle (10) not only shields the heart, but also helps to absorb the considerable shock when the frog lands upon its front legs (22) after its leap when the hind legs (13) transmitted their thrust via ilia and urostyle (12) to the last trunk vertebra.

## 6 DRAFTING SOME CONCLUSIONS

Many tautological relationships between various linkological parameters have been stated in sections 3 and 4 of this article. Obviously to devise a linkogram of any aspect of biological phenomenon is tedious but unexpectedly rewarding because of two reasons. One is that when you think that you have exhausted the possibilities of making sense of the problem under review, new ideas spring to mind. For instance between entity (4) and entity (14) could have been fitted a new entity receiving links from those two. That new entity is the front-hinged tongue. Not only does it make up for a lack of larynx for any rearward attachment, but it compensates for a lack of neck by giving the frog further reach to catch its prey. Also another new entity could have been the fact that frogs lack webs between the toes of their front limbs. Having a highly vascular skin could result in much loss of blood upon landing if the web existed and became torn! The second rewarding reason is that the linkogram approach brings out the 'tailor made' aspect within the design-linkage that special creation put there.

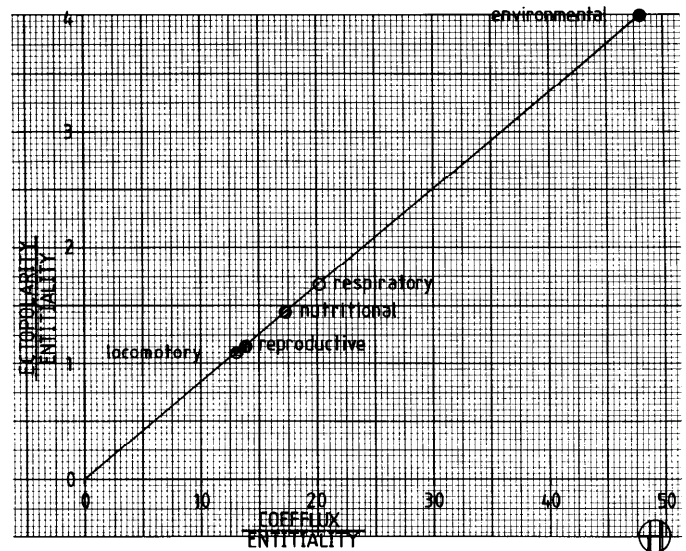


Figure 8. Plot of seriation I.

### 6.1 Challenging computer programmers

How wonderful it would be if a computer program was constructed to produce an array such as the tables and figures included within this present article. One useful starting point would be to use the Link List shown in Table 3 as the initial data. Even more time-saving would be the ability of a program to display a selection of linkogram diagrams from that initial data. Not only could panels of experts decide which scheme looked aesthetically most pleasing, but also identify which linkages submitted by creationists were likely to reveal cause for praise and admiration to the Originator of Species rather than to the human submitter.

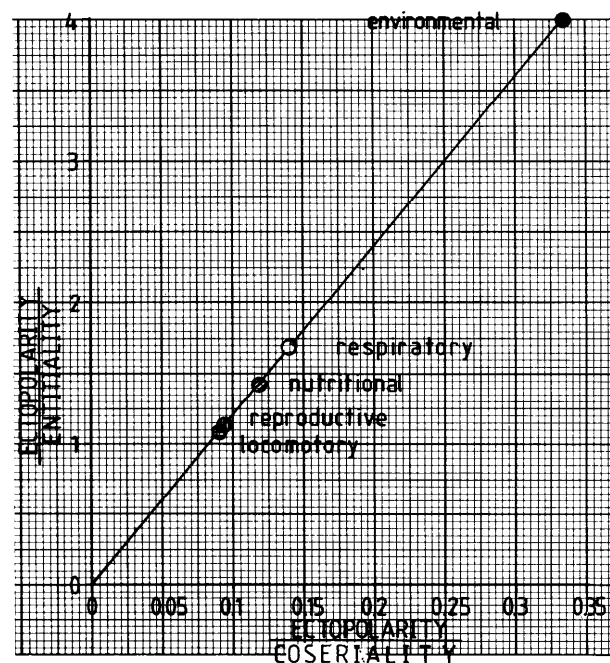


Figure 9. Plot of seriation II.

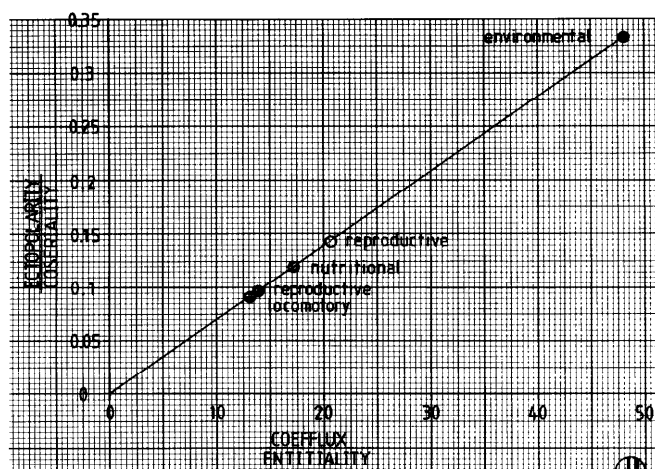


Figure 10. Plot of seriality III.

## 6.2 Coining an aphorism

In the quest for a way to determine the extent to which each function contributed to the linkogram representation of the Common Frog a discovery was made. It was that those entities having the greatest number of 'OUT' links compared with their relatively small number of entities ascribed to a particular function produced the greatest contribution. Therefore, Figure 8 is a plot of functions in terms of their ECTOPOLARITY divided by their ENTITIALITY on the y-axis and their COEFFLUX divided by their ENTITIALITY on the x-axis. You see, both axes are measuring the same thing which boils down to 'STATUS THROUGH SERVICE.' But that is only one way of plotting what I have termed seriality. Figures 9 and 10 show other methods of obtaining the rank order of contribution of each function under study.

Figure 11 represents something of a climax in that it shows a high degree of correlation between functional seriality and the revealed sequence of Special Creation as recorded in Genesis chapter one. In other words, the higher the value of their contribution towards the overall 'design linkage' of the adult Common Frog, the earlier certain items were created or mentioned in the Days of the Creation. However, the value of 4.0 for environmental seriality was difficult to apportion. That was owing to the frog being equally 'at home' in jumping through air (made in Day 2) when traveling over dry ground (formed in Day 3) as well as swimming or diving in pond-water (that could not have predated Day 3). So that plot was omitted.

Realising that the y-axis co-ordinate of each function's seriality is the same as shown in Figure 8, it only remains to explain how their x-axis co-ordinates were calculated. Air for respiration was formed on Day 2, but as we do not know the exact time of its creation, let us plot it half-way through that day to give a value of 1.5. (Here I am assuming that God evaluated what He had just made for as long as it took Him to create). Vegetation for nutrition (see verse 30 and the Introduction of this article) was formed on Day 3. If the first



Figure 11. Days of the Creation. The plot of linkological seriality with revealed Creation.

half of that day was occupied with forming dry land, then the second half was taken up with the creation of plants. So, other things being equal, plants were made mid-way through the second half of Day 3 and therefore have a value of 2.75. Next, assuming that frogs were created on Day 5 and that God told them to multiply, a value of 4.5 can be given to reproduction (for frogs). Finally, assuming that the sexes were created close by each other in the same pond, after amplexus the couple would by twilight be migrating to another pond. Therefore, I would place locomotion at the end of Day 5 close to the start of the evening belonging to Day 6. So locomotion in frogs receives a value of 5.0.

Whatever faults and imprecise facts this study of the adult Common Frog's form and function contains, they cannot detract from my aim to show that the organism is a suite of parts programmed to be perfectly adapted both to other parts within its own body and also to its food and to its partner of the opposite sex outside of itself. To try to devise a scheme to show the sequence of evolution for the adult Common Frog would, I believe, be a much harder task than this linkological evaluation. Could it be that here is evidence that creation has leap-frogged evolution?

## Reference

1. Romer, A. S. 1966. Vertebrate paleontology. University of Chicago Press. P. 100.



## NOTICE OF BOOK

(Continued from page 233)

tical use. He suggests that a more fruitful course, about the turn of the century, would have been to investigate the nature of light, and its relation to space the aether, or whatever one may choose to call it. Of course, it is not yet too late to try such an approach; and, to be sure, several investigators are doing just that.

## THE CARBON PROBLEM

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*The sheer quantity of carbon in the form of coal and oil, in the earth's crust, seems to offer problems for any young-earth view of origins. Here possible solutions are considered, in particular, the possibility of an at least partly abiogenic origin, and the possibility that the deposition continued for some time after the year of the Flood. There is also the question of carbon in the form of carbonates, which needs some consideration.*

For the most part both the actualist<sup>1</sup> and the creationist views hold that all oil and coal are the chemical remains of dead plants and animals. Whitcomb and Morris reject the inorganic view of the origin of oil by stating,

Another extremely important fact is that apparently all petroleum is organic in origin. There have been inorganic theories of origin in the past, but the accumulated evidence now is overwhelming that petroleum has an organic basis.<sup>2</sup>

Because of this rejection of the inorganic origin of oil they are forced then to view oil as the decay product of plants and animals buried during the flood. They state,

The exact nature of the organic material has been as yet quite unsettled, but there seems little doubt that the vast reservoirs of organic remains, both plant and animal, in the sedimentary rocks constitute a more than adequate source.<sup>3</sup>

and speaking of the organic origin of coal,

... it is obvious that his conclusion as to the manner of coal formation fits in perfectly with the Biblical Deluge.<sup>4</sup>

One can, however, find difficulty for such a view after an examination of the distribution of carbon in the crust<sup>5</sup> shown in Table 1. This table illustrates the problem presented to the position cited above. The quantity of carbon contained in oil is 666 times greater than the carbon found in all the plants and animals on the face of the earth today. Coal is estimated to contain 50 times more organic carbon than is currently in the entire biosphere.

If oil and coal represent the remains of plants and animals killed in a one-year Flood, then the preflood earth must have been 716 times more lush than at present. Is this reasonable?

It seems not. Assuming that the entire preflood earth had been covered with a tropical rain forest, (and it is difficult to envision the earth any more lush than that) then there is still seven times more coal than could conceivably have come from plant life on the earth's surface (see Appendix). If all the organic carbon in a world-wide tropical forest were converted into oil, it still represents only 1/138 of the total needed to produce all the oil in the world.

The above analysis does not include the large quantity of organic carbon found in the fossil record in the form of carbonate shells. Clark and Stearn describe the Mission Canyon formation and the Livingstone formation of Canada.

Much of the massive limestone formation is composed of sand-sized particles of calcium carbonate, fragments of crinoid plates, and shells broken by the waves . . . Even in Mississippian rocks, where whole crinoids are rare fossils, and as a result it is easy to underestimate the population of these animals during the Paleozoic era, crinoidal limestones, such as the Mission Canyon-Livingstone unit, provide an estimate, even though it be of necessity a rough one, of their abundance in the clear shallow seas they loved. In the Canadian Rockies the Livingstone limestone was deposited to a thickness of 2000 feet on the margin of Cordilleran geosyncline, but it thins rapidly eastward to a thickness of about 1000 feet in the Front Ranges and to about 500 feet in the Williston Basin. *Even though its crinoidal content decreases eastward, it may be calculated to represent at least 10,000 cubic miles of broken crinoid plates.* How many millions, billions, trillions of crinoids would be required to provide such a deposit? The number staggers the imagination.<sup>6</sup>

Thus the problem for the creationist lies in the view that the Genesis Flood accomplished all of its geological work in one year and thus only one preflood biosphere could have been buried. The three major aspects of the carbon problem—the origin of oil, the origin of coal, and the remains of life left in the form of shells, will be examined in this paper.

### Origin of Oil

Two schools of thought have dominated speculation concerning the origin of petroleum and natural gas—those who believe oil is derived from the decay of organic material and those who believe it to be the result of inorganic chemical processes. As noted above, the majority of those who have studied the issues have come down on the organic side of this issue. However, due to the brevity of the creationist time scale, a creationist may find the inorganic origin of petroleum worth looking into. We will look at the strengths and weaknesses of both views in order to determine whether the inorganic view is a tenable position.

The actualist organic view of the origin of oil states that dilute concentrations of organic matter gradually

**Table 1. Distribution of Carbon in the Earth's Crust ( $\times 10^{18}$  grams)**

|                     |       |
|---------------------|-------|
| Petroleum           | 201   |
| Coal                | 15    |
| Limestone           | 64200 |
| Present Biosphere   | 0.3   |
| Preflood Biosphere* | 1.45† |

\* (Assuming land-mass the same as at present.)

† See the Appendix.

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accumulated over millions of years. As the organic material was buried deeper, the temperature rose, slowly "cooking" the organic material and converting it into natural gas and petroleum. With slight burial more gas than oil is produced. As depth of burial approaches 8-13000 feet, the temperature is such that more oil is produced than natural gas. After strata have been buried below 15,000 feet, the organic material and the oil below that depth is converted to natural gas.

After the conversion process has taken place, the oil must migrate or travel to a place in the subsurface suitable to trap the oil. These localities are called reservoirs, and it is for these that the oil companies search. Thus the oil and gas are not believed to have formed at the same locality at which it is pumped out of the earth. On this aspect, nearly all would agree.

The creationist organic viewpoint will follow similar reasoning. The major differences are the source of the buried organic material and the time believed necessary to convert the organic material to hydrocarbons. The writers cited at the beginning of this article held that the organic material came from the preflood biosphere.

The inorganic position views petroleum as the result of polymerization of the methane ( $\text{CH}_4$ ) which is believed to be an out-gassing product from the earth's mantle. In this view the methane escapes to the surface along deep seated faults and then migrates through the sedimentary rocks to the reservoirs. Along the way the methane and other hydrocarbons are joined to form the longer carbon chains making up petroleum.

Arguments for an organic origin include the following. First, just as the amino acids, proteins, etc., in living things are all optically active, of the left-handed variety, so in petroleum such isomers show some optical activity, being more left-handed than right. But usually there is some of both kinds. This has been interpreted as the result of racemization of the originally all left-handed isomers with time. If, then, it is said, the materials were originally all left-handed, it is reasonable to suppose that they came from living things, where such exclusive left-handedness is found.

Secondly, certain chemicals found in petroleum resemble those found in living systems. Porphyrins are a group of chemicals which are found in oil and which are believed to have been derived from chlorophyll. In other words, they are touted as chemical fossils. Hodgson and Baker stated,

The presence of the chlorophyll-type structure in petroleum pigments suggests that a chlorophyll (e.g. chlorophyll "a") might be the initial pigment, and the abundance of this compound in nature strengthens the suggestion.<sup>7</sup>

Other chemicals with structure similar to those in living creatures and plants are those with structure similar to carotene, ring hydrocarbons similar to cholesterol. Petroleum even has a predominance of chemicals with an odd number of carbon atoms. Hydrocarbons formed by plants are also predominantly odd numbered.<sup>8</sup>

Organicists also point to the fact that tiny remnants

of life are found in oil. Levorson citing Sander's 1937 investigation stated,

He found a wide variety of micro-objects in crude oils from many pools. The long list of materials he found includes calcified or siliceous skeletal tests or frameworks, petrified wood fragments, foraminifera tests, minute pyrite globules or concretions, vegetable remains encrusted in silica, small crustaceans, insect scales, barbules, spore coats, algae, fungi cuticles, resins, and fragments of coal and lignite. Some of this material may well have been entrained in the petroleum from a foreign source as it moved through the rocks. The large variety of organic material, however, suggests a genetic relation between it and the petroleum in which it occurs.<sup>9</sup>

Another argument advanced by the organicists is based upon the observation that oil is not found in volcanic regions. If oil were the product of methane outgassing from the mantle, why then is petroleum not found in those regions? Also oil is not found in crystalline rocks other than in the weathered zone immediately below the sediments. The reason, according to the organicists, is obvious; oil is not the product of outgassing.

The final argument advanced by the organicists is that if oil formed inorganically deep in the earth and then migrated to the present sedimentary reservoirs instead of forming from the organic material found in shales, why then are sand reservoirs found that are full of oil, surrounded by shale with no major faults connecting the sand body with the deeper parts of the earth? Shale tends to stop oil from flowing through it so a sand body surrounded by a shale would be hard to fill with oil. The Morrow sand of Oklahoma has many reservoirs like this. If the oil is inorganic in origin then there appears no pathway for the oil to enter the sand. This proves, the organicists say, the organic origin of oil.

These are the best of the arguments in favor of organic origin. If one is to successfully argue for an

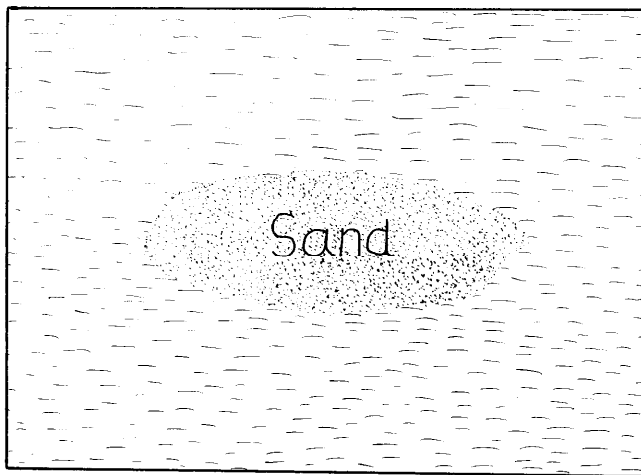


Figure 1. Isolated bodies of sand, surrounded by shale and containing oil, are found in such places as the Morrow formation in Oklahoma. It has been argued that the oil in the sand could not have come from anywhere but the shale, and that a biogenic origin of the oil is thereby implied. But see the discussion in the article.

inorganic origin for petroleum, one must successfully and convincingly counter these objections. We will take each of these arguments and examine them critically.

First, the fact that hydrocarbons in both oil and life are predominantly left-handed isomers is weakened greatly by the report that amino acids in the Murchison meteorite are overwhelmingly left-handed.<sup>10</sup> Optical rotation of polarized light traveling through organic matter from the Orgueil Meteorite has also been reported.<sup>11</sup>

The significance of finding predominantly left-handed organic molecules in meteorites is that the organic (in the chemical sense) matter presumably came from an (actually) non-organic source. If left-handed isomers can be produced by non-biologic means, then the force of the argument that left-handedness means life is dissipated.

The second argument that certain chemicals found in oil imply a biological origin for petroleum is weak for two reasons. First as Hunt noted,

All hydrocarbons identified in life and petroleum still represent a minor fraction (probably less than 10 per cent) of crude oils—and most of this is in the higher boiling fractions—gas, oil and above. None of the light paraffin hydrocarbons in the ethane, nonane range have been identified in significant amounts in living things or in recent sediments, though they make up a major fraction of petroleum and are found in most ancient sediments.<sup>12</sup>

Secondly, porphyrins have been synthesized abiogenically and thus the existence of porphyrins may not imply that oil was generated biogenically.<sup>13</sup> Thus due to the fact that porphyrins constitute such a small percentage of crude oils, the fact that they can be formed abiogenically and the fact that the major chemicals of crude oil are not found in living systems or sediments today, it would appear that the inorganic hypothesis better fits the data. Then the biologic-simulating chemicals were either added to the oil during migration or formed abiogenically.

The tiny microfossils in oil reported by Sanders do not prove that they traveled from the source of the oil to the reservoir along with the oil. As Leverson noted, these objects could have become trapped in the oil during migration. Since both views of oil's origin agree that oil has migrated, this type of entrainment is not implausible.

The statement that hydrocarbons are not found in volcanic regions is just not true. It is true that no hydrocarbons are detected in the gases emitted by a volcano; but this is not unexpected. At the elevated temperature and oxidizing conditions at the surface of a volcanic vent, any hydrocarbons present would be quickly destroyed. However, several reports of exceptionally high methane levels are reported from structures associated with volcanos. Near Lake Kivu in Africa is the Nyiragongo lava lake. The bottom waters of Lake Kivu are saturated with methane. Gold and Soter noted,

Perhaps the most striking example is that of Lake Kivu, which lies in the East African Rift valley; its deep waters contain some 2 Tcf (Trillion cubic feet) of dissolved methane, the largest methane

anomaly for any lake in the world. It contains an even larger quantity of dissolved CO<sub>2</sub>. Attempts to account for the CH<sub>4</sub> anomaly with a biogenic source have not been particularly convincing. The entire region consists of young volcanic rocks and the bottom sediments in Lake Kivu are not extraordinary. (The neighboring Lake Tanganyika, also occupying the rift, possesses much deeper sediments but has no such methane anomaly.)<sup>14</sup>

Gold and Soter also report that when Mid-Atlantic ridge basalts are pulverized small quantities of methane are liberated.<sup>15</sup> Welham and Craig<sup>16</sup> report large emissions of methane from the hydrothermal vents on the East Pacific Rise. The rise is a submarine ridge similar to the Mid-Atlantic ridge and is believed to be a spreading center where young oceanic crust is produced. There is little chance that the methane is biogenic. This methane is released at such a rate that all the methane in the oceans could be replenished in merely 33 years.

One final evidence of hydrocarbon generation in the earth's mantle comes from a surprising source—diamonds. Diamonds are found in their primary deposits only in geologic structures known as kimberlite pipes.<sup>17</sup> These pipes are believed to have come from more than 75 miles deep because it is at that depth that the thermodynamic conditions allow for the formation of diamonds rather than graphite. Giardini and Melton report,

Diamonds formed within the earth's mantle, also have been found to contain occluded hydrocarbons, plus hydrocarbon-forming constituents such as H<sub>2</sub> and CO. Furthermore, Giardini, Salotti and Lakner (1968) and Giardini and Salotti (1969) have shown that petroleum can be formed by the non-biogenic reaction of H<sub>2</sub> with carbonates and carbonates are now known to be of upper mantle as well as crustal origin.<sup>18</sup>

The lack of oil in the crystalline basement is perfectly understandable. Oil in rocks occupies tiny pores in between the individual rock grains. In crystalline rocks such as granite there are very, very few pores so there is no place for the oil to be held. Only in the very uppermost granite is oil found; and this is because fractures or tiny cracks in the granite actually hold the oil. If there are no pores, there can be no oil; so this argument is specious.

The final argument against the inorganic view involves the oil-soaked sandstone completely surrounded by shale with no major faults to allow the oil to migrate into the sand. The problem with this objection is that there is no *sedimentary* rock which has no microfractures—including shale. Thus the oil could have used microscopic pathways into the isolated sand body.

Therefore I would conclude that the evidence for the organic origin of oil is weak at best. The inorganic origin of oil does resolve many difficulties presented by the organic theory to the young-earth creationist position.

One interesting side benefit of the inorganic view is that since the carbon contained in oil would have come from within the earth, there would be no carbon-14. Carbon-14 is made in the earth's atmosphere not in the earth's interior. This would easily explain why oil

contains no carbon-14 and still allow it to be young. If on the other hand oil were the result of the decay of biological organisms and were young, and the concentration of C-14 appreciable when the organisms grew, surely oil would then contain significant quantities of C-14.

### Origin of Coal

The second part of the carbon problem concerns the fact that there is 50 times more carbon in coal than in the present biosphere. If one were to place a lush tropical jungle over all the earth then there is still 10 times too much coal. Even with the extreme assumption that a lush tropical forest covered the entire pre-flood world, oceans and land, there would still be twice as much carbon in coal as there would have been in that much plant matter. The known reserves of coal listed in the 1982 Encyclopaedia Britannica contain an estimated 6.75 times more carbon than the estimated lush pre-flood biosphere could reasonably have contained. How are we creationists to deal with facts like these and still retain a rational belief in a young earth? Considering the size of the problem, there appear to be only two possibilities which explain the situation—first, coal was enriched by methane outgassing and second, the geologic work of the Flood lasted longer than one year, as outlined in earlier papers.<sup>19, 20</sup>

The currently accepted uniformitarian view of the origin of coal holds that coals are the partially decayed and carbonized remains of plants that lived, died and were buried in the same general locality. Primarily, it is believed that the plants were swamp plants which did not decay completely when they died. A layer of peat is believed to have collected over a long period of time, gradually building in thickness. Eventually, the land in the area of the swamp subsided and was covered by the ocean and the peat layer was subsequently buried by other strata. After its burial the peat was compressed and with increasing temperature and pressure, the peat was gradually transformed into coal.

Within the uniformitarian system of thought, this theory fits well. It is supported by the fact that swamp-like plants and animals are found in the Carboniferous coal deposits, the major coal deposits in the world. The present view is also supported by trees found standing upright. (Although it may be questioned whether they could have been buried that quickly.) Francis states

One phenomenon frequently advanced as proof of autochthonous coal formation is the presence of tree trunks standing upright in coal seams, with attached roots standing in the soil forming floor of the seam—i.e. the stigmata of Lycopods.<sup>21</sup>

Certain facts, however, tell against this neat view of coal's origin. The first problem concerns the huge masses of plant matter necessary to form the observed coal seams. F. H. Knowlton reported,

As already indicated, the Corwin formation reaches the enormous thickness of over 15,000 feet and contains forty to fifty coal beds which range from 1 or 2 to over 30 feet, ten being over 4 feet thick and suitable for mining, the whole aggregating at least 150 feet.<sup>22</sup>

Schuchert and Dunbar report that one bed in this

region is over thirty feet thick.<sup>23</sup> In the Homer district of the Kenai Coal field in Alaska there are 30 coal seams ranging from three to seven feet in thickness.<sup>24</sup>

None of this sounds impressive until it is realized that it has been estimated that it takes 10 feet of plant matter to form one foot of peat and 12 feet of peat to form one foot of coal.<sup>25</sup> It would require 3600 feet of plant matter or 360 feet of peat to form the thirty foot coal bed reported by Schuchert and Dunbar. Thus for plant matter to form the aggregate total of 150 feet of coal reported by Knowlton, 18,000 feet of plant matter must have been deposited in that one area, according to the previous assumption. I would submit that that thick of a layer of plant matter would seem hard to account for even in a world-wide Flood.

As for the uniformitarian theory of coal's origin, W. G. Woolnough stated,

Again, nowhere in the world, at present, can accumulations of vegetable matter be found which are *quantitatively* commensurate with any of the major coal deposits of past geological time.<sup>26</sup>

The reason that we currently don't find such huge masses of peat is that the peat decays nearly as fast as it is produced.<sup>27</sup>

The second problem with the current view is that occasionally marine fossil shells are found in the coal.<sup>28, 29</sup> The existence of these marine fossils is utterly inconsistent with the view that coal represents the deposits of a fresh water swamp. Marine creatures could neither tolerate the fresh water nor the swamp trees the salt water.

The third problem with the uniformitarian theory of coal formation concerns the sediments interspersed with the coal itself. Quite often beds containing deep sea crinoids and clear water coral alternate with coal seams.<sup>30</sup> Stutzer in arguing for a marine algal origin for coal noted,

Likewise, we know of coal beds which are overlain by marine strata. These must have originated at the bottom of an ocean. Why, then, may not some coals also have been deposited on the ocean bottom.<sup>31</sup>

Erratic boulders are often found in coal, far from any lithologically similar stone. Stevenson reports,

Fragments of rock are the foreign bodies which are the most perplexing . . . Roemer soon afterward described 3 small fragments from a coal bed in Upper Silesia; they were of crystalline rock, unlike anything known in Silesia. E. B. Andrews in 1870 announced the discovery of a waterworn quartzite fragment in the coal at Zaleski, Ohio, half embedded in the coal. Newberry in 1874 saw a fragment of talcose slate in the parting of coal No. 1 at Mineral Ridge, Ohio, which he thought might have come from the Canadian Highlands; somewhat later he found a rounded quartzite fragment in the Block coal, resembling a Huronian rock in Canada.<sup>32</sup>

Sedimentary erratics resembling local carboniferous rocks, are found in Belgium.<sup>33</sup>

Within the uniformitarian explanation of coal's origin, these erratics are believed to have been carried into the coal seam by trees which had rocks entangled in their roots. The trees were supposedly uprooted

from stream banks and washed into place. There are enormous problems with this view as noted by Stevenson,

The weight of some fragments, upwards of 100 kilogrammes, is too great to admit of transportation by *Stigmara*, while the presence of blocks of mud would suggest that hollow trees had shared the work. In any event, there would always remain the remarkable purity of coal, so difficult to explain in view of the great amount of inorganic material known to be transported by floating trees.<sup>34</sup>

Thus the actualist explanation of the erratics fails. Indeed, the creationist explanation of extremely rapid deposition during a one-year Flood may encounter difficulties in explaining the presence of sedimentary erratics which presumably required some time to form prior to its subsequent transportation and burial in the coal.

The next problem confronting the swamp theory is one that has been quite regularly pointed out by the creationists. That is that non-swamp plants are often found in association with coals. Pine, spruce, hemlock, sequoia and other dry land conifers are found in European and North American lignites.<sup>35</sup> Palms, birch, beech, magnolia, cinnamon and others are reported from Cretaceous coals.<sup>36</sup> This would seem difficult to explain on the basis that coal formed in swamps.

Modern deposits of peat generally do not lie conformably on top of the underlying rocks. (Figure 2.) Francis, citing Fox's work, notes,

In no known instance in India have coal seams been found unconformably overlying older strata and never directly on granitic or gneissic rocks. In contrast, the general mode of accumulation of peat is one of unconformity on the rocks below.<sup>37</sup>

Thus we must conclude from all of the above that the classical actualist or uniformitarianist view of coal's origin cannot be correct. On the other hand, is it really necessary to hold that only one biosphere produced all the coal? Are there other alternatives?

This author feels that there are at least two alternatives within the creationist framework to account for

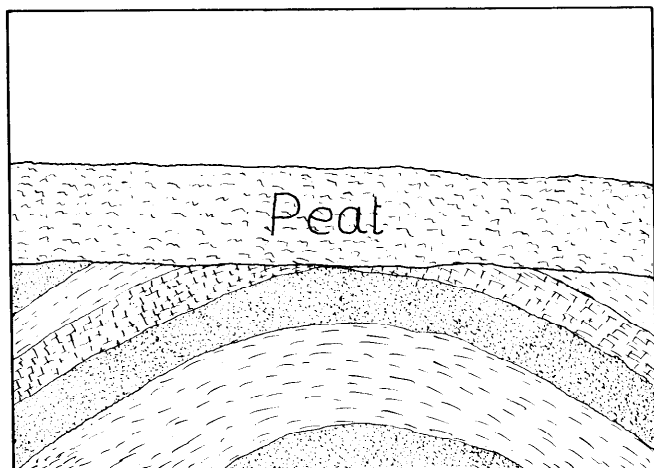


Figure 2. Peat normally lies unconformably over the lower beds.

the massive amount of carbon. The first possibility, a radical view of the origin of coal, assumes that much of the carbon in coal is not organic. According to this view, organic plant material was deposited, by whatever means, and this organic layer contained much, much less material than required by classical coal origin theories; but it acted as the center for further carbon deposition. After the burial of the organic material, methane outgassing enriched the carbon in the organic layer. Gold and Soter suggest,

Although the origin of coal is widely believed to be completely understood, we think that it, too, has frequently (but not always) a relationship to ascending methane. In circumstances where free hydrogen is allowed to escape rapidly, and where temperature, microbial and catalytic actions favor the dissociation of methane, carbon will be shed from the gaseous stream. This may account for the fact that many fossils in coal are found to be highly enriched in carbon relative to the original plant matter; some fossils are so infused that the interior of every cell is filled with carbon. Occasionally a well-preserved fossil can be found embedded in an otherwise homogeneous matrix of coal. In such cases, it seems unlikely that it was other plants of the same kind and period, suffering the same treatment, that resulted in the homogeneous coal seam.<sup>38</sup>

Undoubtedly many readers are having the same reaction to this idea that this author had when he first heard of it. There are, however, several pieces of data that seem to fit well with this idea. First, contrary to most people's conception of coal, coal is not normally recognizable as plant matter. The *Encyclopaedia Britannica* states,

For the most part, no macroscopically recognizable plant remains are found in coal; on the other hand, well preserved remains and indications of plant life are found in the underlying and sometimes the overlying deposits.<sup>39</sup>

Occasional fossils are found in the coal, as has been noted above, but primarily coal is a relatively homogeneous carbon-enriched material. The finding of fossil plants in strata above and below coal may or may not be indicative of coal's origin. After all fossil plants are quite often not in association with coal.

Gold and Soter cite regional correlations between coal and oil where large coal and oil deposits are found in the same region. Such areas include, the Appalachians, Alaska, Colombia, Wyoming, Iran, and Venezuela. There are also vertical correlations of oil, gas and coal. They report,

In addition to regional correlations, there are also vertical correlations; the same region may show particularly rich deposits of coal, oil and gas, all vertically stacked, but spanning very long periods of geologic time. In Indonesia there are regular sequences of oil and coal vertically stacked above one another. The San Juan Basin of New Mexico is a particularly good example; gas and oil in large amounts are found in deep Mississippian sediments more than 300 million years old, above which are multiple coal seams of Cretaceous age (about 100 million years old). The biogenic theory

is hard pressed to explain why the same small spot should have been repeatedly favored for production of rich organic sediments at totally different epochs, when local topography, climate, and all other surface conditions had changed completely. However, one can understand on the basis of long-lived deep methane seeps that the augmentation process would have been at work at all levels, and with different results depending on the detailed local conditions.<sup>40</sup>

### Precambrian Coal

The best evidence, however, that methane outgassing played a role in the origin of coal is the existence of Precambrian coal. Within the uniformitarian system of thought, the Precambrian was a time during which there were no plants with which to form coal and yet, the coal is there. Mancuso and Seavoy relate,

Anthraxolite is a name suggested by E. J. Chapman for a black, combustible coallike solid found in Precambrian rocks that resembles anthracite coal but occurs in veins and fissures. It was regarded as having been formed by the low-grade metamorphism of liquid bitumen that was probably derived from algal remains. Deposits of coal or anthraxolite could well have been the source for high-grade graphite deposits. Occurrences of coal and anthraxolite have been reported and described from a number of localities in the Precambrian rocks of Michigan, Ontario, the Northwest Territories and northern Minnesota.<sup>41</sup>

Several interesting items stand out about these Precambrian coals. First they occur in veins and fissures cross-cutting the Precambrian sediments. Coal, as noted above and by Mancuso and Seavoy,<sup>42</sup> is usually conformable with the beds above and below it. (Figure 2.) Anthraxolite and the presumed metamorphic remains of anthraxolite, Precambrian graphite, cuts across bedding planes. Secondly, the anthraxolite must have been introduced into the Precambrian sediments *after* the sediments were deposited but either before or during the metamorphism of the sediments. Since metamorphism is a product of proximity to a heat source and since igneous activity is an excellent heat source, one must wonder if the anthraxolite was associated with the igneous and metamorphic event. In that case, anthraxolite formation would be associated with activity deeper in the earth. The third outstanding feature of anthraxolite is its widespread occurrence. Anthraxolite veins 2-3 meters thick occur in the Sudbury basin in Ontario,<sup>43</sup> in the Gunflint chert of Ontario,<sup>44</sup> in the Crimea and Siberia,<sup>45</sup> Sweden and South Africa.<sup>46</sup> Fourthly, even some opponents of the abiogenic origin for hydrocarbons have yielded on the question of the origin of anthraxolite (uraniferous hydrocarbons). Professor G. Mueller conceded,

The case for the abiogenic origin of the uraniferous hydrocarbons seems to be very strong indeed; their high oxygen/hydrogen ratios are in sharp contrast with the much lower values of all known biogenic substances, and most of the localities are situated within large intrusions of granite, far removed from probable or conceivable organic sediments.<sup>47</sup>

More recent geochemical studies have supported the view that at least part of the carbon in anthraxolite is of Precambrian origin. Hayatsu, *et al.*, report,

Although there is no direct proof that the polycondensed aromatic-rich material in the sample was deposited at the time of the Gunflint sedimentation, it is very likely. This means that the major portion of aromatic-rich material is of Precambrian origin.<sup>48</sup>

One interesting occurrence of a similar substance is the Albert coal of New Brunswick, which was mined in the last century. The coal vein is contained within sedimentary rocks of Carboniferous age. Hitchcock reported that this coal occurs in "true cross-cutting veins, not in sedimentary beds like ordinary coal."<sup>49</sup> He also concluded that the Albert coal must be compared with the asphaltic and bituminous veins found in the Quebec group in Canada. Older crystalline rocks are found only two to three miles southwest of the Albert coal. Once again there is a correlation between igneous and metamorphic rocks and vein coal implying the possibility of a genetic connection. The possibility of at least a partially inorganic origin of coal should not be rejected out of hand.

The second possibility for explaining the huge quantity of carbon is that more than one biosphere was buried during (or after) the Flood. This author has suggested that the period during which the geological work of the Flood was accomplished was longer than one year. In fact, several centuries was the suggested duration. In this fashion several biospheres of plant material could have been buried and formed coal over a period of time. Whatever method one uses to account for the huge quantities of carbon in coal, the model of origins postulated should be able to accommodate the fact.

### Limestone

In today's oceans, limestone is deposited by both chemical precipitation and organic deposition in the form of shells, corals, etc. Unfortunately this author has been unable to find any estimate of the percentage of organic limestone; and without that information the third part of the carbon problem will remain at least partially unresolved. It must, however, be admitted that the number of biospheres which would be needed to account for the organic portion is quite large. For instance, the estimated 10,000 cubic miles of broken crinoid plates, if spread evenly over the earth's surface would form a layer over three inches deep. This is the organic material from just one limestone bed from northwestern North America. Other beds conceivably could add as much. The upper Ordovician limestones of the mid-continent are up to 80 or 90 percent shell material.<sup>51</sup> The Austin chalk upon which Dallas is built is little more than several hundred feet of dead microscopic animals. The Monterey Formation in California is composed primarily of dead diatoms—thousands of feet of them.

However, even apart from the organic problem is the quantity of CO<sub>2</sub> necessary to have deposited the observed amount of limestone. Gold and Soter report,

Estimates have been given for the total amount of CO<sub>2</sub> that would have been required to produce all

the sedimentary carbonates, ranging from about 15 to 80 Kg/cm<sup>2</sup> over the surface of the Earth. We adopt a value of 50 Kg/cm<sup>2</sup>, equivalent to some 50 atmospheres. There was probably never a very large amount of CO<sub>2</sub> in the atmosphere at any one time, but rather it seems to have been put away into limestone more or less as fast as it was supplied. In contrast, Venus, the sister planet of the Earth (with comparable size and density), has outgassed about 95 atmospheres of CO<sub>2</sub>, all of which remains in its atmosphere to this day, as there is no ocean to precipitate it.<sup>52</sup>

These problems with limestone are real. One explanation which would fit the facts and retain a young earth is that the geologic work of the Flood lasted over some period of time considerably longer than one year. Noah, indeed, was only on the ark for approximately one year; but Noah, his immediate descendants and the animals could have lived in some secluded highland location while the effects and work of the Flood raged on at lower altitudes.

### Conclusion

Whatever explanation for the carbon problem is finally accepted it is hoped that these thoughts will point the way to the final resolution; and it is urged that creationists who are familiar with these matters undertake some investigation of the various possibilities.

### Appendix

If one were to kill all the plant material in one hectare in a moist tropical forest and then weigh the dried plant remains, he would find that there are on average 525,000 kg per hectare.<sup>53</sup> Assuming that the forest extended all over the present land area of the earth the dried biomass would be 525,000 kg/ha × .001 ha/m<sup>2</sup> × 1.49 × 10<sup>14</sup> m<sup>2</sup> of land on earth = 8.05 × 10<sup>15</sup> kg of plant material. Since living systems are about 18% carbon<sup>54</sup> then there would be 1.45 × 10<sup>15</sup> kg or 1.45 × 10<sup>18</sup> grams of carbon. Since we have assumed that the world-wide tropical forest represents the preflood biosphere we can now use this value to find how many biospheres it would take to produce the coal, oil and gas that we observe.

Using Hunt's estimate of 201 × 10<sup>18</sup> grams of carbon in petroleum means that there is 201/1.45 = 138 times more carbon in petroleum than would have been in the preflood biosphere.

Using Hunt's estimate of 15 × 10<sup>18</sup> grams of carbon in coal means that there is 15/1.45 = 10.3 times more carbon in coal than would have been in the preflood biosphere. The Encyclopaedia Britannica in its 1982 edition listed proven coal reserves as 11.6 × 10<sup>12</sup> metric tons, which is 1.16 × 10<sup>19</sup> grams of coal. Using a value of 84% carbon which is reasonable for bituminous coal implies 9.8 × 10<sup>18</sup> grams of carbon. Thus there is 9.8/1.45 = 6.75 times more carbon in the proven coal reserves than could have been in the assumed preflood biosphere.

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## THE ARCHAEOLOGY OF WORDS AND THE ALPHABET

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*Just as long-buried artifacts can provide clues about the history of their former owners, so languages, and the symbols with which they are written, can help to throw light onto ancient matters. It is noted that there is no trace of an evolutionary origin for the alphabet, any more than there is for language. As is well known, many ancient peoples used their alphabet also as a system of numerals. Moreover, there seem to be connections between the alphabet and the calendar, which suggests that the forms and arrangement of the letters owe something to astronomy.*

### Introduction

There is abundant evidence that before widespread travel across the seas was undertaken by the Phoenicians, Greeks, Carthaginians, Egyptians, and Romans, certain key names and words had already been taken by land and water throughout the world, perhaps even to lands now buried under miles of ice, as, for example, the Antarctic continent.

Although these names and words have undergone change over the centuries, they can still be found in their changed forms when competent scholars study the native place names of rivers and mountains, of volcanoes, waterfalls, lakes, islands, regions, towns and cities.

Moreover these same names and words are found in personal and tribal names, in mythological and deified names, and in the names for animals, birds, fish, flowers, trees, foods, and parts of the body. Only half-concealed in the spoken and written languages of widely separated peoples in the world are intriguing clues to man's ancient past. These key words, blended into many combinations in many languages can be identified in two distinct groups. Words of the first group are found in all parts of the world. Key words of the second group are found in the Mediterranean area, Europe, Africa, parts of Asia, West Indies, Brazil, the Gulf Coast of Central America, the east coast of North America, Japan, the Philippines, Australia and New Zealand. Thus two old dispersions of people have been identified and recorded. Further it is startling that legends about the garden of Eden, the ex-

pulsion of Adam and Eve, the temptation by the serpent, the sharing of forbidden fruit, the confusion of tongues at the Tower of Babel, and the story of the great Flood were found in Middle America by the Spanish before priests began their work with the Indians. Clearly such claims by students of language must be examined.<sup>1</sup>

If we live in the kind of young world described in Genesis, if the world was destroyed in a universal Flood, if Noah's three sons and their wives began to repopulate the entire world, if the confusion of tongues really happened as described, if the Table of Nations is a true genealogy of nations and the accurate description of language families, there ought to be some hints of the great events half-buried in the languages which have come down to us. It is not necessary that there be such evidences, but just as ancient artifacts have been preserved over millennia down to the present, we need not be surprised to find equally ancient and impressive linguistic "artifacts" if we look closely at language.

What might we look for? The root meaning of some modern words could well go back to interesting facets of the daily life of our remote ancestors. If in very ancient times man was the kind of world traveler/navigator described above, there ought to be some linguistic relics lying around to support such a view of the past. If we live on a young earth, there ought to be some evidences in languages of interactions among peoples before the great separation occurred at Babel. If earliest man was as sophisticated as modern man, there is no reason to accept the notion that the alphabet was a relatively recent discovery made many thousands of years after cruder forms of speech had been

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developed, e.g., a syllabic system. If the old appearance of the earth is due to the consequence of a number of catastrophic events, some such memories ought to be concealed in some words which have come down to us. In much of the above, place names ought to be of particular value in shedding light on many aspects of the ancient past. All in all, language has unusual potential in relating back to our remote past. In this work we make something of a pioneering survey of words, the alphabet, and our number system which clearly was derived from the alphabet.

We know that even the most casual examination of our language and of place names—cities, lakes, rivers, mountains—shows many traces of the natives, the conquerors, and the immigrants for hundreds of years in the past. Scholars have noted that we can follow the path of Alexander the Great as he conquered the known world of his day by observing the place names that still exist all the way from Macedonia to India. These place names capture moments of history 2300 years ago. We are beginning to realize that place names go back farther still.

In the attempt to search into languages for clues to the ancient past, the searcher must be aware of some of the characteristics of language. Important information could well be overlooked otherwise.

It is essential that anyone who works with various Indo-European languages be acquainted with Grimm's law, which shows the orderly changes which many words have undergone from time to time and from language to language. Knowledge of Grimm's law helps one to see and understand why father, pater, and Vater are three forms of the same word, as are brother, frater, and Bruder. We also see precisely why the following word pairs are identical—the one being derived lawfully from the other: pes and foot, tres and three, duo and two, granum (grain) and corn, and cornu and horn. Awareness of the above helps the reader understand relevant examples given by linguists. The Jacob Grimm (1785-1863) who discovered the law is the same person who worked with his brother to collect the famous Grimm's Fairy Tales.<sup>2</sup>

Further, the modern form of a word or a place name is generally established on the basis of consonant structure, rather than on vowels, prefixes, suffixes, aspirates, etc. There are many examples in the Middle East of the interchangeability or confusion of L and R, just as we find today in the Orient. Consonants are astonishingly durable over the centuries within words. Amateurs are not qualified to establish relationships between words, since words that appear to be closely related may have nothing at all in common, e.g., the words cornu and corn above. Yet very dissimilar appearing words may be derived one from the other. When one studies examples, the concept of consonant structure becomes clearer: The word Philistine is precisely the same as the word Palestine, Copt is another way of spelling Egypt, Massilia is Marseille, Neapolis is Naples, Firenze is Florence, Gades is Cadiz, Megiddo is Armageddon, Iskanda is Alexander, Heracles is Hercules, Aryan is Iran, Ecuador is the word equator. We can understand that Venezuela means "Little Venice," when we know that the discoverer found a village

erected on piles on the shore of the Gulf of Maracaibo in 1499 which reminded him of Venice.<sup>3</sup>

But there is another side of the coin. We look in vain for any relationship between the words Germany, Deutschland, and Allemande. Yet all three are exactly the same in geographical meaning. The word we use in this case depends on where we live. This fact poses many problems for the study of ancient place names.

Having discussed some possibilities one might look for in using language to search out the past, and being aware of several basic characteristics of language, we may now proceed to look for examples of how useful language can be to gain insights into the distant past.

### Clues in Ancient Writing

Place names can give valuable clues for locating ancient sites. By taking seriously a place name given to him by Arab companions, Glueck rediscovered an important copper mining site in the Negev from the time of King Solomon, 3000 years ago. The Arabs kept referring to the place called Khirbet Nahas, which means "Copper Ruin."

Nelson Glueck observed that the most ancient geographical names are faithfully reflected in modern designations. As examples he cites the following from the Jordan Valley: Eriha is the word Jericho; Beisan is old Beth-shan; Damieh is biblical Adamah; and Tell Abil is Abel-beth-maachah. When the explorer or the archaeologist is searching for an ancient site it is crucial for him to pay attention to the modern place names in the area he is searching.<sup>4,5</sup>

Another value of word study is shown by the following. Based on lexical analysis, Semites must have lived together in an original land of rivers and no mountains. There is evidence that the land was in the Arabian Desert. Rawlinson observed that linguistic evidence showed the early existence in Arabia of at least two races: one in the north and central of Semitic peoples, and the other in the south, which was non-Semitic. The latter possessed a language resembling the dialects of aborigines in Ethiopia.<sup>6,7</sup>

Support for this analysis was reported by McClure. An extraordinary discovery was made in the Arabian desert—ancient rock carvings of tall black cattle people just like the Watusi-Masai of today in Africa. He suggests the possibility that the people of East Africa may very well be living descendants of the ancient ones who lived in Arabia when it was a fertile, well-watered land.<sup>8</sup>

From the above reference to rivers we can infer another point to be emphasized later, that we have clues to a golden time before a catastrophic event created the desert we now know in that region.

We can learn something about the sophistication of a culture and other insights of their life from the texts which have been preserved. Cyrus Gordon analyzed many ancient texts and believed he had identified ancient cryptograms of great interest. These are messages within messages.<sup>9</sup>

An old Mesopotamian language, Akkadian, was no longer in use after 1500 B.C. The fact that they had a word for iron, as well as for tin, copper, lead, gold, silver, and bronze, says a great deal about the culture of these people at that time in history. It is especially

interesting to note their familiarity with iron centuries before the Iron Age began, although it is possible they knew only meteoric iron at that time.<sup>10</sup>

Baring-Gould mentions the tradition in England that some of the counting-out rhymes, such as are found in nursery rhymes, may be relics of formulas used by the Druids in choosing human sacrifices.<sup>11</sup> It is entirely possible that similar rhymes served as mnemonic or memory devices for ancient mariners in plotting their voyages by the movements of constellations, each of which had an easily remembered common name.

Just as the Arab has a great many words for camel which show almost every imaginable state and condition, and the Eskimo does the same with words for snow, so the Egyptians used at least 37 terms for our word heaven and more than 370 specific astronomical terms. There is no way we can translate many of these terms accurately. This is a good example of how differently ancient man viewed the universe around him. There can be little doubt that the Egyptians and other ancients could read valuable information out of the stars, particularly with respect to navigation and other travel.<sup>12</sup>

Albright speaks too of the values of word and language studies for the historian in tracing interacting continuities, and in providing useful and sometimes unique evidence of otherwise indiscernible ethnic and cultural relationships far back in time. Further, he notes that the analysis of personal names is a powerful tool for tracing various ethnic elements in an old population. This study, for example, showed the surprising presence of Indo-Europeans in Syria and Palestine during the Late Bronze Age. The continued presence of Indo-Europeans is clearly noted in the Amarna Letters (thought of as from the 14th century B.C., but there is interesting evidence for reassigning the letters to the ninth century B.C.). Often we are dependent on personal and place names as our only source for an entire language. Albright makes the very interesting observation that although Egypt was not within the Semitic language family, there are few grammatical features which could be considered alien to Semitic languages, which may suggest a close relationship or other early interaction between the two.<sup>13</sup>

There are curious links between ancient languages. Albright comments on the fact that Sumerian, the oldest known literary language of man, showed a remarkable breakdown in the phonetic structure of individual words and compounds which are quite comparable to that which now exists in Chinese. There were so many syllables that had the same sound that Albright concludes they had to distinguish them by tones in the Chinese manner. While there is no direct evidence, he can draw no other conclusion. Similarly Sayce states that Sumerian is related to the language of China, and the first Chinese emigrants and the pre-Semites of Chaldea were related linguistically and racially.<sup>14, 15</sup>

Albright speaks with amazement about the mobility of ancient languages (as though world-wide travel were a common thing) and he speaks confidently that scholars will soon locate Old World sources of elements of the oldest American cultures.<sup>16</sup>

The historical links between different areas in the ancient world and a further suggestion of widespread land and sea travel are illustrated by the strange duality of place names. Musri north of Assyria is the same as Musur or Misir, which is Egypt. Cush was an area in Cappadocia and later Cush became the name for Ethiopia. The place names of Makan and Meluhha in Babylonia were the same as names of districts far to the southwest, probably in the Sinai region. Akkad was the name for both Armenia and for the northern part of Babylonia.<sup>17</sup>

Ur of the Chaldees has been located in Sumer by a general consensus of scholars for many generations. From early studies of Ebla tablets it is beginning to dawn on scholars that Abraham probably came from another Ur many hundreds of miles to the northwest of Sumer. The point of interest is that man apparently traveled very widely. When he did so, he left clues behind in the form of place names and loan words to other languages.

We can infer at least some hint of catastrophic events in the past from clues left in the language. In actions we do not really understand, ancient writers give every appearance of describing a world which had undergone significant, even radical change. In a highly sophisticated age, Aristotle still referred respectfully to the grave testimony of the ancient writers. It is more than a bit significant that in the very earliest writing, the writers behave like worried and doubting commentators. They tried to explain a dimly understood tradition and half forgotten words once of great significance.

Neither in ancient Egypt nor in old Sumer could the ancients explain the origin of the star lists, the constellations, or even the names of their greatest gods. Every appearance is given of a world which had undergone significant, even radical change.<sup>18</sup>

Similarly in Homer the art of writing is associated with peril, and among many peoples writing was too sacred a thing to fall into the wrong hands, so sacred books were handed down orally from generation to generation even though writing for other common purposes was used.<sup>19</sup>

One final example will be given to show how clues to the ancient past might be derived from ancient writing. Already more than a century ago it was observed that much of mythology—a form of coded history in the minds of many scholars—relates scriptural happenings. Thus Jove may be but a corruption of the name Jehovah.<sup>20</sup>

### The Alphabet as an Artifact

It seems fair to say that most people look at the alphabet and see nothing in particular—certainly nothing exciting. It has always been there. Scholarly accounts of the history of the alphabet reflect dull and incurious eyes. Still, most would agree that the alphabet is the greatest of all inventions, and there ought to be excitement and adventure about it. With only several exceptions, we cannot ask the same questions about the alphabet as we did earlier about ancient writing in general. However, we can expect to learn something about widespread early travel and unexpected interaction between distant nations as we fol-

low the quick spread of early forms of the alphabet. We also may learn something of early sophistication if we discover that the alphabet is older than generally thought, and we may even find relics in the alphabet hinting at catastrophes in the past. This seems to be expecting a great deal from a simple row of letters.

If we are to shed light on prehistory, or more properly, ancient history, the following questions will be important ones to pursue. The time of the origin of the alphabet is a vital question. Does the conventional account of the Phoenicians and the alphabet pretty much sum up the whole story? Does the development of the alphabet support an evolutionary view, or can we find evidence for early and unexpected sophistication in matters related to a writing system? If there is some great organizing principle for the manner in which the alphabet was drawn up, a number of peculiarities might be explained. Can we find any such organizing principle? It is crucial to attempt to learn where the symbols themselves came from. Are they familiar objects found in the ancient community? Are the symbols abstractions drawn from nature, or is there some other source? The order of the letters seems rather odd. Can we find any compelling reason for the manner in which they are arranged in ancient times? The fact that people are notably resistant to change has long been observed. Reforms of the alphabet seem to be unusually resistant despite the fact that such proposed reforms are often clearly superior and beneficial. George Bernard Shaw, for instance, was just one of many who invented a "better" alphabet; but his effort, like others before and after, failed to win acceptance. Is there something involved in the failures to accept reform which goes beyond typical resistance to change? There seem to be some indications that the alphabet was a more useful tool in the distant past than it now is. Is it possible to gain insights into the ancient world from this factor? The name of the inventor of the alphabet is given in some myths. Is it possible to identify the actual inventor, and if so, what light does this shed on ancient history for us?

When we look closely at the alphabet as an artifact, that is, as something shaped by human workmanship of historical interest, we can expect to find some clues to the nature of the ancient world which can help us fashion a more satisfactory framework for history.

Since there have been many, many modes of communication in the past, the question naturally arises as to whether these modes of expression can be placed into some kind of time sequence to show development from primitive and simple to modern and complex. Man has communicated by means of a thong with knots and its highly developed form, the quipus, the notched message stick, painted pebbles, beadwork or wampum, rock paintings and carvings, engraved and scratched bone and ivory, pictorial symbols, cuneiform writing on clay tablets, hieroglyphics painted or carved or pressed on various surfaces, drums, and smoke signals.<sup>21</sup>

The use of the quipus was far more widespread than one might think, and its peculiar pattern of use around the world is an example of how one might infer something about ancient travel. The quipus consisted of a main cord to which at given distances thinner cords of

different colors were fastened. Each cord was knotted in various ways for special purposes, each color having its own significance. The Chinese have a tradition that the old fathers first used knotted cords to maintain the memory of events. Later they invented written characters which were then substituted for the knotted cords. The quipus was used along the west coast of Africa and in Egypt, in Australia, in China, and in the whole Pacific region from Melanesia to Formosa. It was also used in Scotland and in Germany, but its best known use was among the Incas in Peru. As a memory device it has never had an equal.<sup>22, 23</sup> To assume that the quipus was a primitive step preceding the invention of writing is only conjecture. There is nothing primitive about the quipus and its use was deliberate to keep sacred wisdom and privileged information away from the wrong eyes and ears.

More than 2000 years ago the Greeks and Romans considered five different possible inventors of the alphabet—Phoenicians, Egyptians, Assyrians, Cretans, and Hebrews. Two millennia of further consideration have clouded the matter further. Every country in the eastern Mediterranean region has been nominated, including Egypt, the cuneiform-writing countries of Sumer, Babylonia, and Assyria, Crete, the Hittites, Cyprus, and others. Others believe the Philistines brought the alphabet from Crete to Palestine, or that the alphabet was developed at Ugarit in Syria. The astonishing finds at Ebla in Syria since 1974 may influence further theoretical work on the origin of the alphabet. Most scholars simply assume an evolutionary model developing from prehistoric geometric symbols used throughout the ancient world.<sup>24</sup>

For generations we have been lulled with the story that writing began with pictograms in Mesopotamia and Egypt. Much later the Phoenicians somehow came up with an alphabet which was very widely spread and copied. Yet contrary to popular and scholarly views and assumptions, there is good evidence that most of the alphabetic signs are older than hieroglyphs. The alphabet was not derived from hieroglyphs or pictograms.<sup>25</sup>

There are false trails in the study of origins. After enormous amounts of futile discussion, linguists conclude that their studies have yielded little or no evidence about the origin of human speech. Assumptions have not been supported. Long ago acrimony reached the point where *La Société de Linguistique de Paris* made a standing rule that no papers on this subject may be presented at its sessions. Another vain effort has been the study of the speech of primitive peoples in order to shed light on the origin of speech. As far as we know there is no sign that any language spoken today has had a shorter history or a slower development than any other. Another lead has been the study of the speech of young children, but this too has yielded no significant results on origins. Hope springs eternal in the linguist's breast, however, and the focus now is on patterns of communication in the animal world in comparison with that of man.<sup>26</sup>

It is certainly relevant to this discussion to note that no society is known at any point in history which did not have a fully developed language.<sup>27</sup> Neither in language nor in the alphabet are there any reasons to believe in any sequence of simple to complex as required

by an evolutionary model. Certainly there has been much change, but not in a simple to complex sequence, and this is a very significant observation.

When we go back farther in time, we find the unexpected. In various cave sites in France and Spain, conventionally dated about 8,000-10,000 years ago, letters, writing, and symbols preliminary to a form of written script have been found.

M. Ed. Piette found at Mas d'Azil about 1896 a large number of pebbles in a stratum between the last Reindeer age and the first Neolithic period, in the so-called Magdalenian age. The layer was more than two feet thick of red and black color and with the pebbles were cinders, perforated deer teeth, harpoons, wheat, nuts and fruit seeds. The marks on the painted pebbles are not accidental. A great number closely resemble symbols of the alphabet. Nine agree with inscriptions found in Cyprus. Eleven correspond closely with Phoenician letters.<sup>28</sup>

At Glazel another mystery was found. Among axes and pottery was found an incised tablet with signs and letters similar to Phoenician or Greek signs. Again the tablet was dated long before such writing is thought to have been developed.<sup>29</sup>

The mystery of writing deepens with a report from the Prehistoric Laboratory of Bordeaux University in 1972. An engraved beef bone found at Pech Laze, France, one of the earliest samples of written communication, was hailed as one of the greatest scientific discoveries of our time. The bone was dated at 135,000 years old.<sup>30</sup> There is ample reason not to take such conjectural dating seriously, but the find nevertheless raises puzzling questions about the origin of writing.

Another complicating factor is the recent discovery in Bulgaria of baked clay disks or seals on which incisions are present. Scientists are agreed that the seals, dated no later than 4000 B.C. contain ideograms or pictographs. This is many centuries earlier than the oldest writing found in Sumer or Egypt. The situation is so chaotic that articles begin with the familiar refrain: "Until recently it was supposed that . . ." One can well understand that scholars are reluctant to have this aspect of civilization begin in Bulgaria and spread from there to Egypt and Mesopotamia.<sup>31</sup>

All in all, it seems fair to say that some important ingredients seem to be missing in the current attempts to explain the origin of modern writing.

### The Alphabet as a Sign of Sophistication

The study of the alphabet shows us something of man's great sophistication in very early times, widespread travel, and interaction with distant lands and peoples.

After much study, Gordon concluded that the original alphabet served three functions simultaneously: arithmetic, calendric, and phonetic. Thus, depending on the context, the letter "a" stood for the number value of "1," the first day of a month, or the phonetic sound we associate with it. Only the last function has survived to the present day in our culture. This three-way use of each letter in ancient times provided an infinite store of possibilities for memory devices to re-

member and transmit the culture orally. Such memory devices were used in navigation, world-wide travel, science, technology, mathematics, astronomy, time reckoning, land and marine architecture, cartography, principles of economics, law and religion, agriculture, animal husbandry, weaving, ceramics, metallurgy, and writing. We can assume that little rhymes or sayings could be accurately and quickly coded and decoded into formulas, procedures, laws, and the like. Illiterate Mayan peasants still retain the amazing skill and speed of their ancestors in making calendrical calculations. This skill deserves study which may reveal to us something of the sophistication of the ancients. The ancient Sea People had to have an alphabet for direction finding and time reckoning. They had to have a calendar for the solar year and for the seasons. They needed a system for calculating the lunar cycles, for their records, and for bookkeeping. The astonishing thing is that they only needed from twenty to thirty symbols for accomplishing all these tasks.

Our present alphabet, which retains only the sound values, is a shadow of the real miracle of this invention.<sup>32</sup> (It is true that we do make some use of the alphabet in ordering things, e.g. from A to Z; but note that we use a different set of symbols from our numerical ones.)

Vere Gordon Childe notes that the hieroglyphic script comes from elements whose origin is clearly derived from the plants and animals of the Nile region animals. Yet its curious combination of phonetic signs with ideographs and determinants agrees so strikingly with the Babylonian that the two systems must be interrelated.<sup>33</sup>

One dialect of Indo-European Hittite was printed with movable stamps or type. The example found in Crete was the mysterious Phaistos disc, which must have been carried there from Asia Minor. The disc has not been deciphered. As one intriguing possibility, the Phaistos disc could be a highly sophisticated device to lead the mariner to a distant port, each symbol of the spiral being a significant astronomical or land checkpoint on the way. It is more likely that all the symbols are astral due to the spiral design of the disc. The ancients associated the spiral with the movements of the constellations in the heavens.

Carvings said to be Phoenician, other Mediterranean languages, or unknown scripts have been reported in many parts of the world. Such carvings have been reported in large numbers in the Amazon and Orinoco River tributary systems. More evaluation is needed of these reports. Many inscriptions have been found in past years in the Andean Plateau which cannot yet be translated and which are thus far unidentified as to origin. Among other mysteries reported having to do with language is a recent find in the Well of the Virgins at Chichen-Itza. Associated with 13th century artifacts was a doll crudely made of wood and wax. A few Latin letters were carved on it. The Spanish did not arrive there until the 16th century.<sup>34, 35</sup> The mystery, however, fades when one reads Fell,<sup>36</sup> where he has made an interesting but controversial beginning in deciphering many old inscriptions found in America which were long written off as frauds or which were simply ignored.

### Is There an Ideal Alphabet?

All would agree that the ideal alphabet would have one and only one letter for each speech sound, with perhaps a few concessions made for common compound sounds to be represented by a single symbol. For example, the long "i" sound in English is clearly a combination of two separate vowel sounds, and we would find it awkward to use two symbols to represent that sound today. Accepting the genius of the invention of the alphabet, it is more than a little strange that no alphabet in common use in the world has ever reached this goal.<sup>37</sup> It is of course somewhat arbitrary which sounds uttered by the human voice are to be recognized and dignified with a symbol. Yet strangely, all alphabets omit symbols for some common vocal sounds, and all contain redundant letters, that is, letters that represent sounds already provided for by other symbols. We can illustrate the idea of redundant letters by looking at ways one might spell out the sound of -ks as in "marks." One might spell it -CS as in lilacs, or -X as in box or -Q's, -CKS, -KES, or -CHS. On the surface this may appear simply as another case of human stupidity or as a consequence of borrowing from different languages. Those who have attempted to reform the alphabet for the best of reasons have all failed. Our alphabet seems to be tamper-proof. We know that ancient Egypt had an alphabet of 24 symbols and chose not to develop its communication system by this means. The Chinese also in the most ancient times had an alphabet but elected to develop its present complex system instead. From these odd facts one can only conclude that some other very compelling factor entered into the formation of the ancient alphabet.<sup>38</sup>

According to Moran,<sup>39</sup> religion is the only imaginable organizing principle behind the alphabet. Although some kinds of worship may well have sprung up independently, e.g., sun worship, the slaughter of a bull at the time of the spring equinox on both the altars of Ur and in the Valley of the Han in China shows common roots in a common culture. The 12 signs of the zodiac (the twelve constellations), the 12 months known throughout the ancient world of Europe, Asia, and North Africa point to a common source. The 52-year cycle was used both in the Orient and in pre-Columbian American cultures with 13 days of houses in a quarter. Lunar and solar calendars were brought into correspondence by the cycle of 52. The 52-card deck with 13 cards to a suit faithfully reproduces ancient calendrical knowledge. Even the Joker serves a calendrical function for leap years. The twelve signs of the solar zodiac may be in some way derived from the lunar zodiac of 27-28 signs. The relationship of the two is very unclear, but many of the same stars are involved in both sets of signs. From this well of astronomical/astrological knowledge, the alphabet was drawn. To establish the source for the alphabet, one must show its great antiquity, wide diffusion, and some powerful cohesive principle outside itself in order to hold the signs in established order despite time, geography, and circumstances.

Gustavus Seyffarth, a 19th century scholar and rival of Champollion on the decipherment of Egyptian hieroglyphics, served for a time in the 1850's on the

faculty of Concordia Theological Seminary, St. Louis, Missouri. He understood two things clearly in our context which he expressed in his many writings. He was one of the first to grasp the idea that much actual history was concealed in myth and legend. Further, he realized the overwhelming importance of the heavens in the life and culture of ancient man. Although Seyffarth is wrong in some of his conclusions, and though some of his work is necessarily conjectural, his voluminous works deserve careful study and reworking. He saw the connection between the alphabet and the skies about 150 years before this principle was re-discovered by Moran and Kelley.<sup>40</sup> Seyffarth states:

It is said and believed that our alphabet was invented by Cadmus in 1500 B.C., but this cannot be considered a historical fact. In the New Testament we read of a book that was written by Enoch 900 years prior to the Deluge. Pliny said that man always had literature. The Vedas and Avesta tell us that prior to the Deluge sacred books existed and that, in consequence of their loss, the human race became so wicked that the Creator resolved to destroy it.

The Koran (Sura 57) mentions that Noah was the author of a book. . . . It is true that Cadmus invented the alphabet, but Cadmus means "ancestor," i.e., Noah. Cadmus was, like the latter, the first planter of the vineyard.

All these and similar traditions concur in demonstrating that the alphabet existed prior to the Deluge. . . . The Noachian alphabet was a representation of the zodiac.<sup>41</sup>

Seyffarth held that our alphabet is a reproduction of the zodiac with the constellation of the planets at a point in time of 3446 B.C., Septuagint chronology, apparently at the end of the Flood, probably according to the observation of Noah himself. Seyffarth translates Phoenician, Chinese, Chaldean, Greek, and Roman myths which clearly relate the formulation of the alphabet to the zodiac.<sup>42</sup>

An idea explored by both Seyffarth and Wadler focuses on the peculiar placement of the vowels in the alphabet. There is no logical sense in their location in our present alphabet, nor in any other alphabet: A**b**c**d**E**f**g**h**i**j**k**l**m**n**O**p**q**r**s**t**U**v**(W)x**(Y)**z. Wadler noted that the ancients associated the vowels as follows with the "7" planets: ao-Sun, i-Moon, e-Mercury, o-Jupiter, aw-Venus, oo-Saturn.<sup>43</sup> Thus the intriguing notion has arisen that vowels in some ancient alphabets represent the position of the planets among the houses of the lunar zodiac, that is, the consonants, at a critical point in human history. Perhaps one reason Seyffarth's discussions have not been studied seriously is the common belief that any use of the concept of the zodiac involves astrology. In the ancient world there was no necessary connection. The above discussion is in no way connected with astrology. It must be said, moreover, that Seyffarth seems to have been less than clear as to just which alphabet he had in mind, which in ancient times included the vowels and perhaps other apparently "useless" letters to indicate the locations of the planets within the lunar zodiac at a crucial moment in history.

Similarly, Moran's theory is that the alphabet was derived from 28-30 lunar signs, and that some of the

signs are the actual appearance of the constellation. Moran argues that the lunar zodiac is older than the solar zodiac. In support of his theory, there are startling correspondences between the lunar and the alphabetical signs.<sup>44</sup>

Regarding the ancient lunar zodiac, its sidereal revolution laid down the lines of the lunar zodiac. The daily stages of the lunar progress round the sky during the space of a month were carefully noted. The moon was the earliest measurer both of time and space. Ancient Hindus used a series of 28 divisions of the lunar track, while the ecliptical arcs were invariably 27 in number. The notion of a 27-fold division of the zodiac was deeply rooted in Hindu tradition. Each letter of the alphabet then represents one of the mansions of the moon: the daily halting place of the moon in relation to a nearby constellation.<sup>45</sup>

One example will illustrate the idea. Our 13th letter, m, comes from mem, a pictorial representation of waters. It probably represented a constellation at the edge of the Milky Way, which was the river of heaven. Many constellations, e.g., the Great Bear, the Little Bear, Pleiades, Draco the Dragon, and others, are the same in name, meaning, and form in China as in the West. Moran concludes that astronomy originated in Mesopotamia (Chaldea), and the Chinese carried it or received it intact.<sup>46, 47</sup>

At one stroke the rediscovery by Moran explains the peculiar order of the letters in our modern alphabets. The calendar signs and hence ancient alphabets, served one function to designate the days of the month. The length of the month, however, differed in various cultures, apparently in conscious disregard of the actual appearance of the moon. The most perfect lunar alphabet, the oldest form known of the alphabet arranged by scribes in a fixed sequence, was that of the Ugaritic ascribed to Late Bronze Age. It consisted of 29 letters plus one phonetically superfluous letter, giving a total of 30. It is no coincidence that the cycle of the moon falls between 29-30 days. Depending on the tradition, the number of symbols for a month varied greatly. The Malaysians used 30 signs, the Chinese 28, some Greek, Tamil and Cambodian lists consist of 27 signs, and the Mayas and Aztecs used 20 signs. Egypt observed a year of 12 months of 30 signs each, while the Maya observed 18 months of 20 signs, plus five days.

The standard Greek alphabet of 24 letters consists of 20 symbols retained in the same order as the ancient Ugaritic. The last four letters, phi, chi, psi, and omega, were added by the Greeks. The last three letters of the 20-letter Ugaritic alphabet were added to an older alphabet of 27 characters, corresponding to the length of the day-name sequences found among the Greeks, the Tamils, and the Cambodians. At one time in both Egypt and Greece we find a week of nine days. The 28 letters of the Arabic alphabet correspond in number to that of the Chinese. Gordon concludes that related lunar lists in both hemispheres reflect an ancient global network of mariners. Gordon also demonstrates a clear relationship between the Phoenician alphabet and the zodiac signs and lunar lists. He further shows the common source of 20 alphabetic signs used by the Phoenicians, the Greeks, and the Mayas.<sup>48</sup>

It is remarkable that the Chinese ideographic system preserves intact the ancient calendar signs. Thus Moran demonstrates a one-to-one relationship between 22 Chinese ideographs and the 22 letters of the Hebrew alphabet.<sup>49</sup>

Kelley collated and compared on both sides of the Pacific the day-names and animals used to represent the days of the lunar month, or the lunar zodiac. His results show no possibility of separate inventions but point to the lunar zodiac as the common source of the more than 200 similiar phonetic alphabets, with due allowance for considerable borrowing of the forms and values of the letters.<sup>50</sup>

### An Afterword

In taking a preliminary survey of language, speech, and the alphabet, we have made some interesting discoveries. The study of words and symbols tell us of ancient sites, culture, geographic setting, and level of sophistication. They tell us of ancient travel patterns and show that ancient travelers left their calling cards all over the world in the form of place names which can be traced back to their sources in the Old World. We see indications of deterioration after a previous higher level which hints at catastrophic events. We find no support at all for any kind of evolutionary development of language. If anything, the evidence clearly shows that languages have become simplified out of a more complex past. The development of English is a good example of this. In all of our exploration we find that the characteristics and events in language and the alphabet fit very comfortably within a framework of history as described in Genesis. Perhaps our greatest surprise is the unmistakable evidence in support of linking the alphabet with star formations. But as we have stressed, such an origin has no relationship at all with astrology. It seems reasonable to say that linguistic studies will continue to be immensely useful and will continue to illuminate the ancient past.

There are many complicating factors. We have noted more than once that deliberate attempts were made in many cultures to keep a knowledge of writing away from all except a small elite group in the society. Writing was sacred, and thus it is no surprise to see civilizations moving from alphabetical systems to more complicated ways. Another factor which must not be overlooked is the tabu. There is the odd Inca legend, for example, that writing was once known but abolished by an ancient ruler in the belief that writing had caused a plague. It seems reasonable to say that cultures changed radically overnight as the result of a tabu imposed by the person or group in power. The tabu may help to explain the curious absence of important inventions in cultures at later stages of development. We know, for example, that the wheel was well known in the Middle American cultures and was used for toys. Yet by the time of the Spanish explorers the wheel was unknown.<sup>51</sup>

The sacredness of writing and the tabu may be better explanations for the peculiar development of writing than any theory of gradual development from primitive to modern forms.

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## THE WORD

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*This article gives a summary of completed research into some of the logical processes required to accept and investigate such concepts as Divine creation, the miraculous and continual sustaining of our present developing universe. These logical concepts are directly related to Scriptural quotations. By applying new and powerful tools from applied mathematical logic it is established that all such concepts are absolutely rational and follow describable rational patterns.*

## 1. The Word: Logos and Rhema

On the back cover of each issue of the *Journal ASA* appears the following quotation taken from Hebrews 1:3, "Upholding the Universe by His Word of Power." Our major interest is to gain some understanding of the meaning of the symbol string "Word" as it appears in this quotation. Does this symbol string denote a literal written or spoken word as it might appear in some humanly established language? Is it a literal word in some language that is beyond human readability? Indeed, what possible meaning can this apparently mysterious quotation have for humanity with its limited comprehension? Non-supernaturalists would probably consider this quotation to have no rational meaning and, thus, to be devoid of any comprehensible

content. For them, these questions would also appear to be meaningless combinations of symbols. For a Christian, such questions as these have comprehensible answers.

The translations from the Greek that yield this phrase do have slight variations. The *King James* translation is "... and upholding all things by the word of his power." The *NIV* states it as "... sustaining all things by his powerful word." The *Living Bible* translation is "... He regulates the universe by the mighty power of his command." The *Concordant Literal New Testament* has it as "... carrying on all by His powerful declaration." Of the 13 New Testament translations in my personal library all, with the exception of *Phillips Modern English*, translate this Greek phrase in a manner that seems to force one to believe that it refers to a literal word. We minimally define a "literal word" as a sequential set of symbols

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formed from some fixed alphabet, that must be constructed by means of a fixed set of rules, that is sequentially inserted between other such literal words as required by yet another fixed set of rules and that has some defined meaning that can be located in a fixed dictionary. This last requirement includes the possibility that a literal word is defined as an "undefined technical term." As it will be explained, there are objects that satisfy these technical requirements, but these objects come from a language that is not humanly transcribable.

In order to be accurate, it appears necessary to consult the original Greek for a proper literal meaning. As to Greek words, we employ the standard transliterated forms. In *The New International Dictionary of New Testament Theology*, Vol. 3,<sup>1</sup> we find under the heading "word," the Greek *logos*. As one would expect, *logos* has 38 pages of analysis. On the other hand, the Greek *rhema* has less than four pages of analysis. This fact apparently indicates that the literal meaning for *rhema* is easily transcribed and not open to any vast variations. The exact Greek that is utilized in Hebrews 1:3 is a form of *rhema* and not a *logos* form. Its meaning is properly translated as follows: *rhema* literally refers to the act of "speaking." However, in this context it is a word "spoken" by Jesus Christ in a supernatural realm. Nevertheless, this phrase appears in the Scriptures and should have some understandable significance. As Colin Brown expresses it, "Religious language represents a kind of model which is not identical with God, because of course it operates on the human level . . . by understanding it the mind is enabled to grasp something of the reality which it represents. Thus, by grasping the words and images of the revelation one is able to perceive something of the reality of God himself."<sup>2</sup>

In what follows, it is shown that such a literal "word" as required by this Scriptural quotation can be rationally assumed to exist. Moreover, we are actually able to partially describe some of this "word's" properties even though no human being can, at present, read, speak or write such a Divine object. We also give a meaningful answer to a seemingly unanswerable question. Is it possible that a human being can ask a meaningful question that appears to have a meaningful answer and yet the answer cannot be expressed in a humanly comprehensible manner?

## 2. The Method

We assume that the intuitive concept of cosmic or proper time is a foundational background for all developing natural systems. A finite or infinite segment of such time is partitioned into a finite or infinite sequence of absurdly small closed subintervals. (Note: We use the Dedekind definition for the finite and infinite.) For example, consider the length of the "small" intervals to be smaller than 10 raised to the negative 1,000,000,000,000 power, seconds or some other similar unit of cosmic time. For each such small interval, consider a finitely long logically consistent narrative description for some universe composed of natural systems as well as numerous natural subsystems as they could conceivably appear at the very instant represented by the first end point of the small

time interval. This narrative description for the appearance of this universe of natural systems should be obtained in a logically consistent manner utilizing some fixed dictionary of words formed from some finite alphabet of symbols. The entire narrative description for each such small interval is to be considered an "intuitive readable sentence or word."<sup>3</sup>

With regard to the above narrative description, it need not be completely specific. For certain natural subsystems, the description might be statistical in nature. More importantly for the natural sciences, each such description might include time dependent expressions that relate the appearance of one portion of this universe for a specific small time interval to portions within other descriptions for other distinctly different small time intervals. For regularity, various descriptions might include certain statements that relate to specific first principles. It is also possible to include diagrams, pictures and other visual or audio information within these descriptions by the processes outlined in "event theory."<sup>4</sup> Each of these narrative descriptions will be called a "frozen segment." We also require that each frozen segment carry within itself a statement that gives the numerical name of the first end point of the small time interval the frozen segment purports to describe. Observe that from the above definition it can be concluded that there exist infinitely many frozen segments per small time interval. For this reason we call the set of all frozen segments for a specific small time interval a "totality." Whether or not a humanly selected frozen segment from a totality imparts into the human mind a partial comprehension of how the universe under investigation would "actually" appear when viewed by means of human or machine sensors is not significant to this analysis. All that we need to assume is that there does exist some description from a totality that imparts into the human mind a useful and comprehensible description that is assumed to correlate to a portion of reality. Of course, one of the major purposes of the natural sciences is to produce such narrative descriptions or as they are usually termed *physical paradigms*.

Consider partitioning a one second time interval into 10 raised to the positive 1,000,000,000,000 power, "small" intervals as previously defined. The entire collection of descriptions composed of one frozen segment from each totality would represent a one second narrative description for the successive stages of the universe under investigation. One can intuitively think of this one second collection of descriptions as a "quantization" of the entire description of a one second portion of this changing universe. Now extending this idea to any cosmic time interval, finite or infinite, we obtain a sequence of narrative descriptions that represent the history of such a universe. Let us call such a sequence a *developmental paradigm*. The last requirement is that all of these word forms, sequences and the like be embedded into the Extended Grundlegend Structure (EGS).<sup>5</sup>

## 3. Divine Deduction

When the developmental paradigms are embedded into the EGS, the mathematician often utilizes various technical expressions in describing their behavior.

However, when a theological interpretation is employed such technical terms as “nonstandard,” “hyper,” “super” or “subtle” are replaced by special translations that relate the structure to theologically meaningful concepts. In what follows, such theological interpretations are utilized whenever they lead to meaningful notions.

The most widely known and most often applied form of human deduction is the classical propositional deduction. This form of deduction can be represented and investigated within the confines of the EGS. When propositional deduction is thus investigated it is discovered that there exists a purely Divine propositional deduction that when restricted to humanly comprehensible word forms is exactly the same as human propositional deduction. The behavior of this Divine propositional deduction is partially describable in a humanly comprehensible language. On the other hand, such deduction has infinitely many properties that cannot be so described. Notwithstanding this difficulty, many interesting results have been obtained and we present the most pertinent.

There exists within the EGS a nonstandard object that can be interpreted as a purely Divine word or unreadable sentence. This word has all of the describable properties of a literal word as previously defined and many properties that do not correspond to a human language. For example, this word behaves from the Divine viewpoint in the same manner as do finitely long human language words even though it is actually infinitely long when human descriptions are utilized. Moreover, it has been determined that this particular Divine word must be composed of at least one purely Divine object from a Divine language. This object cannot be directly translated into a humanly comprehensible word form. The complete Divine word cannot, at present, we believe, be spoken or written down or used in human communication. However, the positive aspects of this Divine word outweigh the necessary lack of knowledge we have as to its internal structure. It so happens that Divine propositional deduction applied to this single Divine word yields in the proper sequential order each and every frozen segment from any developmental paradigm that represents a developing universe. We can assume that each of these frozen segments directly correlates to a real material universe. Indeed, we can include within each frozen segment a correlation statement such as, “The portion of the universe represented by this narrative description exists in reality.”

The basic logical properties of such Divine deduction are not restricted to simply sustaining such a universe by “merely” producing the frozen segments. Certain aspects of how Divine deduction could actually produce such a universe can also be investigated. It has been established that Divine propositional deduction could actually yield such a universe in a supercontinuous or superuniform manner.<sup>6</sup> The notion of supercontinuity can only be conceptually comprehended.<sup>7</sup> It is enough to state that from a mathematical viewpoint supercontinuity is considerably stronger than the continuity that is studied in a first course of Calculus. Superuniformity is beyond any of the ordinary types of uniformity employed throughout science that yield descriptions for the regu-

lar or ordered behavior of natural systems. It is more uniform than anything that the human mind has previously either perceived or conceived. It is a startling beauty that is only enhanced by further investigation.

Research has now shown that there mathematically exists a background or substratum Divine structure that not only includes this Divine deduction but also “pastes together” each and every adjacent frozen segment in a supercontinuous superuniform Divine manner even though there may be no humanly expressible or standard method that could produce such a correlation between adjacent frozen segments. Intuitively, one could describe this as a superuniform supernatural gluing process that is only perceivable when viewed from the Divine world. Even if a humanly perceivable gluing process exists, there still will exist this superuniform supernatural gluing process.

Since we constructed developmental paradigms by selecting frozen segments from each and every totality, then there may be infinitely many distinctly different developmental paradigms describing infinitely many different universes. This possibility leads to an important question. Is there a describable mechanism that yields the selection of a unique developmental paradigm that represents *our* universe?

One of the major procedures that humans employ in order to create a formal deduction is a finite choice *process*. In formal deduction we are given certain infinite sets of words or formulas called logical schema. Further, we are given a finite collection of such schemas. The rules for establishing a formal deduction allow us to select finitely many words from each logical schema. However, no specific set of rules are given that determine which words are to be selected from the schema. The choice is intuitive and buried within the confines of our mental apparatus and, indeed, every individual could select different sets of words and still arrive at the same deductive conclusion. Hence, we do not and probably cannot explain in a more fundamental manner the mental mechanism that yields our selections when such a process as predicate deduction is considered. Throughout mathematics a finite choice process is always allowed. When facts such as these are investigated, it is established that there are acceptable Divine choice processes that yield infinite developmental paradigms and it is rational to assume that each frozen segment contained in such paradigms is either humanly comprehensible or is not humanly comprehensible. As in the human case, it follows that it is rational to assume that these Divine choice processes do not have any humanly expressible rules that guide the selection of specific developmental paradigms. Intuitively, it is rational to assume that these paradigms are selected by a superintuitive Divine mechanism. However, there is an additional possibility that is not present when human deduction is considered. It is rational to assume that there are specific sets of rules for the selection of specific developmental paradigms where the rules are described in a purely Divine language.

Throughout the Scriptures we have the phrase “. . . and God said, . . .” as well as other similar expressions. In these cases, the actual Hebrew word is *‘amar*, which is the ordinary Hebrew word for “said.” We are told that the sense of this word in many instances implies

that when God "speaks" there is a direct correlation between the "spoken" statement and the formation of material objects. "Often, however, there is a much fuller sense where God's saying effects the thing spoken (cf. Gen. 1)."<sup>8</sup> Human beings partake in a similar experience, but of course on a more trivial level. We first think about something, usually in mental words and images, and then after we have thought about it, we then can use the materials that are present in our environment to actually construct objects that apparently did not exist within our environment. Thus human logical deduction is translated into material objects. This leads, in a very interesting manner, to a rational interpretation within the Divine world. *It is rational to assume that the creation and development of every natural system perceived by the human being is produced by Divine deduction and is thus a product of a partially describable "supermind."* As previously indicated, a mechanism for such supernatural creation need not be humanly describable or comprehensible.

#### 4. Rationality

The most important aspect of this search for a "word" that actually fulfills the requirements of Hebrews 1:3 has not as yet been completely stated. The entire description for the "word" and the properties of Divine deduction that have been partially explained are simple translations from an abstract mathematical structure—a structure that is obtained from the most consistent collection of deduced expressions known to the human mind. Thus Hebrews 1:3 is a *highly ra-*

*tional* statement and is not a meaningless combination of symbols. The questions asked at the beginning of this article do have rational, albeit partial, answers. Then also there are consistent questions that human beings can ask that need not have humanly comprehensible answers, but it may be rationally assumed that they do have answers. We all believe that complete answers will be forthcoming during a future portion of our developing universe. Paraphrasing Paul's statement, "We now see through a glass, darkly; then we shall see face to face. Now we know in part; but when that time comes; then we shall know fully, even as we are fully known."

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## PANORAMA OF SCIENCE

### The Age of Oil and Gas

Normally oil and gas are contained in a porous and permeable rock like sandstone or limestone, which is sealed by an impermeable rock like shale. Fluids can travel easily through the porous and permeable rock but have a great difficulty traveling through an impermeable rock. It is this property of shale and a few other rocks which enable oil and gas to be trapped in the subsurface. Conventional views on the origin of oil and gas postulate that tens or hundreds of millions of years have elapsed since the hydrocarbons were emplaced in the trap.

However, several facts imply that hydrocarbon deposits are far younger than conventional views would allow. First, in the case of natural gas, in spite of the fact that gas has considerable difficulty in traveling through shale, it can travel. A recent study<sup>1</sup> showed that methane, the primary component of natural gas, can escape through a 400 meter shale cap with a half-life of 4.5 million years. This would mean the complete depletion of a gas field in only 45 million years. Laythaeuser *et al.*, remark,

Based on the above calculated rate of destruction of commercial-size gas fields, the concept is proposed that gas accumulations in the subsurface have only a limited life in terms of geologic time scales. If this is true, known gas fields in older strata like lower Paleozoic reservoirs can be explained only by assumption of a relatively young accumulation age or by the assumption of a much longer duration of the hydrocarbon generation process than currently accepted.<sup>2</sup>

A second indicator of youth concerns the pressure observed in many reservoirs. Normally the pressure of fluids found in rocks is simply equal to the weight of the overlying rock. However, under certain conditions, e.g., due to rapid deposition of more strata, or due to the folding of the strata, the pressure within an oil reservoir may be greater than that caused by the overlying rock. It is in cases like this that oil wells will produce "gushers," such as the one at Spindletop, (see the front cover) if the flow is not controlled. These cases of higher than normal pressure will dissipate due

to the slow leakage of the fluid through the impermeable bed. Hubbert and Rubey noted,

Because of this continual leakage, abnormal water pressures are thus transient phenomena and require some dynamical activity to bring them into existence and to maintain them.<sup>3</sup>

Hubbert and Rubey show that the pressure would be released according to an exponential law with a relaxation time of one million years.<sup>4</sup> This means that the dynamical activity which produced them cannot have occurred longer ago than 3 million years or the leakage would have released the pressure.

The final evidence for young oil occurrence concerns the lack of ancient destroyed oil reservoirs. Porfir'ev notes,

However, regardless whether one proceeds from organic or inorganic theory, one should observe geologically indisputable cases of ancient destroyed oil accumulations from the late Protero-

zoic to the present. One sees progressively metamorphosed coal accumulations in the stratigraphic record but never comparably altered or destroyed oil accumulation.<sup>5</sup>

Contributed by Glenn R. Morton.

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## BOOK REVIEWS

*The Secret of the Sixth Edition* by Randall Hedtke. New York: Vantage Press, 1983, 136 pages, hardcover, \$9.50.

Reviewed by Paul A. Bartz\*

The way most people in the fields of science, philosophy and religion talk about Charles Darwin one would think that everyone had at least read *On the Origin of the Species*. The fact is, most evolutionists, and most creationists for that matter, have not read Darwin. Randall Hedtke is probably right about why people don't read Darwin: his style is wordy, repetitious and vague. But for someone who was not a communicator in the modern sense of the term, Darwin has communicated a lot.

Randall Hedtke is a public school science teacher, a very prolific creationist writer and a frequent contributor to the *Quarterly*. This book, like the rest of his work is well-researched and clearly written. He has completely researched his subject, and he has produced a tightly-written book which covers a lot of ground.

Two main theses feed into *The Secret of the Sixth Edition*. Hedtke presents a well-thought-out and extended discussion about Darwin's health problems because he feels that there may have been a link between those problems and their disappearance after the publication of the sixth edition of *On the Origin of the Species*. In fact, he makes an excellent case for this link. The second thesis is the secret of the sixth edition itself. In this last edition of *On the Origin of the Species*, Darwin himself actually abandoned natural selection!

Hedtke presents a detailed description of Darwin's illness and facets of Darwin's life which are not often

seen in print. Darwin suffered from very sensitive health. When some daily event would upset his routine he might begin to suffer gastric upset, even to the point of vomiting, headaches, eczema and what at least one clinician has suggested was DaCosta's syndrome: breathlessness, pain over the heart, palpitations and giddiness. All of these are classic symptoms of psychoneurosis rather than of any organic disease. That these were not symptoms of any organic disease is also supported by the fact that rather than degenerating over the years, Darwin's health, at least as far as these symptoms go, improved to normal for the last ten years of his life — which coincides with the publication of the sixth edition of *Origin* in which Darwin rejects natural selection.

Darwin was very sensitive to criticism. He longed for acceptance and saw any criticism as a personal rejection. Logically, then, his symptoms would rise up whenever there was a chance of personal contact with others, ultimately making it impossible for him to have much contact with others. With the publication of the sixth edition of *Origin* he had publicly accepted the critique of others that natural selection could not provide the principle for the origin of new species. Having accepted this criticism, his previous health problems disappeared, evidently because his unbearable tensions were eased by the admission that natural selection indeed could not be the evolutionary mechanism he was hoping for. From this point on Darwin adopted a form of Lamarckianism as the mechanism for evolutionary change.

Hedtke also critiques Darwin's original positions. Darwin's ignorance of the science of his own day is clearly evident in *Origin*. Hedtke provides the documentation which clearly shows that Darwin was not a scientist by the standards of his own day. The book could have been strengthened with a conclusion state-

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ment to that effect since Darwin is usually accepted as a scientist by modern evolutionary historians.

One interesting feature of *The Secret of the Sixth Edition* is Hedtké's presentation of the *Relative Fossil-Production Potential* formula and its application to the index fossils. Here the author presents a very cogent explanation for the documented distribution of the various types of fossils in their characteristic strata. He also predicts, on the basis of this model, that as more rocks are examined there will be a general gradual shift downward in the stratigraphic arrangement of the fossils.

There are many new creationist books appearing every week now. Very many of them seem to cover a lot of the same material as all the rest. *The Secret of the Sixth Edition*, presents fresh material and offers new ideas both about evolution and about creationism. This makes this book a *must* for those who want to discuss creationism intelligently. And I predict that *The Secret of the Sixth Edition* will find continued use in most personal libraries as an often-cited reference.

*James Clerk Maxwell. A Biography by Ivan Tolstoy.*  
University of Chicago Press Edition, 1982.

Reviewed by Thomas G. Barnes\*

Since James Clerk Maxwell is my favorite scientist of all time I was delighted to see this new biography of Maxwell. It is written at the popular level, a paperback book of 184 pages. It is very readable. What is better, it is very much worth reading. Not only is this a biography, it is a fascinating story of the emergence of physics in one of the most exciting eras in science.

Maxwell himself made the greatest contribution to science in that era. The book includes this very strong statement relative to the importance of Maxwell's most noted discovery.

"Richard Feynman of Caltech, a star physicist himself, once stated that in the far future the most significant event of the nineteenth century will be judged as Maxwell's discovery of the laws of electrodynamics. The American Civil War will pale into provincial insignificance in comparison with this important scientific event of the same decade."

James was born into a devout Christian home. His mother died when he was seven. He was brought up by his widowed father in a comfortable three-story home in rural Scotland, where the family had land holdings and were reasonably well off financially. There is a beautiful description of his home life throughout the entire biography. He began experimenting at the age of two. "He had a non-stop mind, boundless energy, and an outstanding memory — by the age of eight, he could recite the whole of the 119th Psalm."

Maxwell had trying times in his life but he always retained his great Christian character. As a youngster he was subjected to barbaric treatment by his classmates at Edinburgh Academy, but he took that in stride. "His frequent chatty letters to his father show

that, despite his tribulations at school, his mind was bright, growing, and far ahead of his peers. The gentility of Maxwell's family upbringing and his sensitivity should not delude us: James was mentally tough and resilient — a *survivor*, who would not be broken by a gang of boys or a Victorian Academy."

"Neither in his adolescence nor in his later years, did Maxwell question the basic tenets of his Christian religion." Biographer Tolstoy adds: "The eventual combining, in one mind, of a unique level of scientific insight and sophistication with a simple, apparently unquestioning faith struck many as curious." Apparently that is also the position taken by Tolstoy.

One would have to read the book to grasp the tremendous developments in physics taking place during this time. This was a period of giants in physics, not the least of whom was Michael Faraday. Maxwell was Faraday's strongest supporter and interpreter of Faraday's electromagnetic contributions. They gave Maxwell inspiration to go on and make the greatest theoretical contribution in that field ever made in science. Faraday while unsurpassed in experimental physics, had little schooling in mathematics. Maxwell graciously took Faraday's communications and sifted out gems and encouraged Faraday and put the mathematics in to support Faraday.

Gauss was another great scientist of that period. Maxwell was knowledgeable of all of Gauss' work.

Sir Horace Lamb was a student of Maxwell's at one time. He later used Maxwell's equations in his theoretical explanation of the source of the earth's magnetic field. (That was of course not included in the biography of Maxwell.)

Maxwell had a hard time getting a job as a teacher, even though he was recognized as the most creative and brightest person available. There was politics in the selection of professors; and Maxwell would have no part in such politics. He did not stay long at his first few teaching jobs. But so far as science is concerned that might be a blessing. He would return to his home and do fantastic research with instruments he built. He designed tops, for instance, with adjustable color segments, for his experiments with color. He was the first to produce color photography.

He did the writing on his most noted book in his home. He loved it there.

In his later years Maxwell was asked to organize the Cavendish Laboratory. Everyone agrees that he was tremendous in that job, bringing in such greats as Lord Rayleigh (the father of acoustics), Fleming (who invented the vacuum tube), Napier Shaw (the father of British meteorology) and many others. He was a close friend of fellow Scotsman Lord Kelvin. While the director of the Cavendish Laboratory he was also the science editor of the *Encyclopedia Britannica*; and his writings there have not been excelled since then.

The scope of his scientific contributions are much too long to list here. They extend from astronomy to a major contribution to the use of statistics in physics. His ideas were ingenious and he frequently illustrated with pictorial analogies. He fascinated the philosophers, e.g., with his use of a fictitious Maxwell demon in portraying thermodynamic principles to show what one could do if one could violate the second law of

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thermodynamics. Unfortunately some scientists take that one too literally and try to let statistics be the demon that can violate the second law.

Tolstoy's primary source of material was the biography published in 1884, *Life of James Clerk Maxwell*, by Maxwell's close friend, Lewis Campbell, and William Garnett who had worked under Maxwell. That is a truly great book, but it is not so readily available as this new one. It was reprinted by Johnson Reprint Corp., New York and London, in 1969 as *The Source of Science*, No. 85. It is a 661 page hardback. It gives more details on experiments and extensive correspondence.

The most noticeable difference in these two biographies is the difference in the philosophy of the biographers. That invariably comes out. Campbell and Garnett endorse Maxwell's strong faith. They include many of Maxwell's letters which contain great depth of spiritual strength and quotes from the Scripture. They include a beautiful prayer which Maxwell had written. It shows his strong traditional doctrinal position. They include correspondence with the Bishop of Gloucester on a profound question relating to Scripture. Whereas Tolstoy comments on this phase of the Campbell and Garnett biography as *irritating*.

This reviewer believes that Tolstoy was attempting to prop up his own beliefs when he wrote: "*In other words none but a true believer can purge himself of mistaken beliefs. This is a profession of faith which it seems is going to be wilfully left unexamined! Maxwell's religious convictions were clearly so deeply imbedded he was unconscious of the incongruities of this sort.*" It is too bad that Maxwell is not around to expose the errors in Tolstoy's dogmatic assumption that Maxwell had *mistaken beliefs*. After all one can not expect the biographer to be the bright one!

*Beginnings: A Portrayal of the Creation*, by Heinz Seelig and Spencer Marsh. Multnomah Press, Portland, Oregon, 1981. 72 pages, 7 color plates, \$9.95.

Reviewed by Paul G. Culley.\*

Do you love the beautiful?

There is a beauty and a majesty and a reverence in this little book of 72 pages, that will delight your heart and quicken your spirit. The subject is God. His presence in each of the days of His creative activity is recognized with superb finesse.

Structurally this writing serves as an appreciation and interpretation of the 7 paintings of an Israeli artist by an American writer. It may be significant that lithographs of these paintings were presented, during the Camp David peace talks, to President Carter and President Sadat.

Men of science, who have met God in Christ, will doubtless receive this book with thanks. To the reviewer it is one of the peaks of his literary satisfaction, discovered while watching the sun rise over forest and meadow.

The art of the printer is almost perfect.

*A Case For Creation* by Wayne Frair and Percival Davis. Third Revised Edition. 1983. Moody Press, Chicago.

Reviewed by Randall Hedtke.\*

The book begins with a clear account of scientific methodology, pointing out, for example, that a valid scientific hypothesis must be falsifiable and that past events do not lend themselves to scientific investigation. The authors then spend considerable time discussing the evidence that is not testable or not falsifiable, namely, comparative anatomy, embryology, behavior, biogeography, biochemistry, etc. I think it is becoming apparent to everyone that it is not difficult, as the authors point out, to formulate an explanation for evidence that is not refutable; one is only limited by one's imagination. Perhaps it is not a question of which point of view can formulate the most plausible explanation, as the authors suggest, or who has the most fertile imagination; rather, after evolutionists' dominance of the subject in the past, the significance to the general public is that there are plausible creation interpretations for the evidence. And, perhaps, generally people prefer an explanation that does not exclude God.

It could well be that the function of nontestable evidence may simply be to reveal the bias in evolution theorists' thinking and undermine the popular belief that scientists are "pristinely" objective. The nontestable evidence, having served the important purpose of revealing bias and providing a place for creation may be dismissed; it can do no more, no matter how many opinions are expressed.

The creationists' strategy should probably be to concentrate on the quality, not the quantity of evidence concerning origins. And in that respect, I would like to have seen the authors place greater emphasis on the testable evidence. Near the beginning of the book the authors state that the question of origins is not a legitimate scientific question. I agree, historical science is really biased speculation. On the other hand, the question of the origin of life is a legitimate scientific question if the mechanism, like natural selection, is ongoing. An ongoing mechanism automatically excludes special creation, which is the fervent endeavor of evolutionists, but is subject to the test of observation or the determination as to whether or not all of its vital components, such as useful mutations and persistent and consistent selectors, exist in the environment. In contrast, a mechanism which is sudden and discontinuous, like punctuated equilibria, is safe from disproof; but, because it is not ongoing, it is not legitimate science and opens the door wide for the creation alternative. Darwin understood this important distinction:

There are, however, some who still think that species have suddenly given birth, through quite unexplained means, to new and totally different forms: but, as I have attempted to show, weighty evidence can be opposed to great and abrupt modifications. Under a scientific point of view, and as leading to further investigation, but little advantage is gained by believing that new forms

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are suddenly developed in an inexplicable manner from old and widely different forms, over the old belief in the creation of species from the dust of the earth.<sup>1</sup>

Which is why when Darwin did abandon natural selection in the sixth edition of the *Origin* he went to the only other ongoing mechanism he knew, namely, Lamarck's acquired characters.

The authors spent an inadequate amount of time, in my opinion, explaining the idea that God created basic "kinds" of plants and animals which "diversified" into various species. One example they give is a "dogkind" diversifying into wolf, dog, coyote, and jackal, which certainly cannot be considered minor changes. In any discussion of the creation of basic kinds followed by diversification, domesticated plants and animals, which may have been specially created with a high degree of genetic variability for human use through artificial selection, must be kept separate from consideration of wild plants and animals. I tend to think just the opposite of the authors, that, when God created "the best of all possible worlds," the goal was variety as opposed to monotony. Because in it he intended to place analyzing, appreciating, and environment-manipulating human beings. Since creation the variety of life has diminished rather than increased, as extinctions would indicate. The authors also give the example of the finches on the Galapagos Islands as an example of diversification (evolutionists call it evolution) from a few original finches. I prefer to think that the present finch population is the remnant population of a created, highly varied bird population.

All in all the book is well worth reading for the uninitiated layman who has been indoctrinated to the evolution point of view for nontestable evidence as well as for the discussion of the scientific method to which evolutionary theory is accountable.

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*Dictionary of Philosophy*, (revised). Editor, Dagobert D. Runes. Philosophical Library, New York, 1983. \$24.95

Reviewed by Wilbert H. Rusch, Sr.\*

By its very nature, a considerable amount of the discussion of origins will properly belong in the field of philosophy. The average scientist writing in this area will often find himself in need of some kind of basic reference work dealing with philosophy. Anyone in this situation who wishes to explore the matter of origins will possibly find this *Dictionary of Philosophy* of some help. This is not basically a new work, having been originally written in 1942. However, the editor felt that the new ideas, methods and concepts that have appeared since that date, necessitated an updating of the original work.

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The result is compilation of clear, concise and correct definitions as well as descriptions of philosophical terms throughout the main range of philosophical thought. Its scope is broad, it encompasses all branches of schools of ancient, medieval and modern philosophical thought. Not only are the important but familiar Occidental philosophies dealt with, but so are the Oriental. It therefore finds use as a passable dictionary of philosophy, as its name implies. It will give specific and adequate information on each of its subjects. This volume accomplishes all this within 360 pages of easy to read information.

However, it must be remembered that it is not an encyclopedia. A philosopher might consider that it suffers therefore in often lacking perspective and depth. For example, in dealing with the specific subject of philosophy, it superficially covers a somewhat broad range, but emphasizes just one area, namely logic. Again, in this same area it devotes just four lines to love. Of course as a single volume dictionary, it cannot offer a good perspective of many areas. Those who wish to explore various aspects of philosophy in greater depth, might consider a 5 volume work offered once in a while as an incentive by the Book-of-the-Month Club. Failing the need or resources to take this route, one might settle for this volume.

The task of producing this work was accomplished by the editor, Dagobert Runes, Ph.D., with the help of some 77 contributors. Each of these is listed in the front of the work, and identified by their initials at the end of their contributions. Regretably there is only one prominent name included, that of Thomas Munro.

Dr. Runes (1902-1982) was the founder and editor-in-chief of the Philosophical Library publishing firm. This work is a fitting close to a long and able career. A list of Dr. Runes' other works would include *On the Nature of Man*, *The Handbook of Reason*, and the *Pictorial History of Philosophy*.



## NOTICE OF BOOK

*Fiction Stranger than Truth. In the Metaphysical Labyrinth of Relativity*, by N. Rudakov, 1981. Available from the author at P.O. Box 723, Geelong, Victoria, Australia. Probably about \$10.00.

The question of the validity or otherwise of the theory of relativity continues to interest many, including, as is apparent, a considerable number of readers of the *Quarterly*. In this work the author undertakes an investigation of the underlying ideas, and of notions which are used but are something less than clearly defined. Along the way, the historical order of various developments is set forth; also some recent variations on the theory (which the author considers to be really rival theories) such as Jánnosy's, are noted.

The author's conclusion is that the theory does not rest on a firm foundation, and that it is of little prac-

(Continued on page 211)

## LETTERS TO THE EDITOR

### Doubts About Genetic Engineering

I would like to challenge the statement by K. Anderson and R. Bohlin in their article "Genetic Engineering — The Evolutionary Link" (CRSQ March 1983) that recent advances in genetics now allow man to "... transcend the barriers between the created kinds of plants and animals."

I suspect that the authors are far too optimistic about the accomplishments of genetic engineering, but since I am not a geneticist, I cannot do more than express my skepticism of this amazing claim.

Perhaps they would like to define exactly what they mean by "created kinds" and "transcend," and then furnish an example and explanation of how the kind barrier has been crossed or broken, if that is what they mean. Such a feat would have very great significance in the creation/evolution controversy.

#### Reference

1. Anderson, J. Kerby, and Raymond G. Bohlin, 1983. Genetic engineering the evolutionary link. *Creation Research Society Quarterly* 19(4):217-219.

Sincerely yours,  
R. G. Elmendorf  
Elmendorf, Inc., Bairdford,  
Pennsylvania 15006.  
Received 26 April 1983.

### Reply to Elmendorf

In response to Mr. Elmendorf, let us first thank him for his critical reading of our article. It is grateful to know that one's work does not go unnoticed. Secondly, to note that he is correct in determining that whether the barriers between the kinds may be transcended depends on the definition of the kind.

We make a fundamental distinction between criteria which may help distinguish the created kinds from each other, such as gametic fusion, gross morphology, chromosome morphology, behavior, etc. and that which constitutes the fundamental essence of any one created kind. In other words, the above list allows us to determine whether a particular organism belongs within one kind or another, but it cannot tell us why the created kind maintains its created integrity in the face of variation segregated out over time. Our theory of the created kind involves the initial *genetic* information originally placed in the created population. This would involve not only structural genes, but also regulatory genes. It is our suspicion that the regulatory genes or programs may be more influential in establishing the kind than the structural genes, many of which are very similar across the kinds.

Genetic engineering, therefore, raises the possibility of forming organisms which will reproduce after their own kind but not with any other. Our ability to "transplant" genetic information from one organism to another in a very precise manner allows us to intelligently alter the initial genetic information in ways that may alter the reproductive pattern of the organism. In a sense, though to our knowledge it has not yet been

accomplished, a genetic engineer may formulate a new "created kind." Since this is only accomplished with the aid of complicated and intelligent manipulation of the already existing genetic information, it should offer no solace to the evolutionist or discomfort to the creationist in regard to the feasibility of a purely naturalistic evolutionary process. Where it does raise questions is that we are now treading in areas where only the Creator has walked before. Therefore our steps ought to be with humility and awe, indeed if we are to tread at all.

Sincerely,  
J. Kerby Anderson  
Raymond G. Bohlin  
Probe Ministries  
12011 Coit Road, Suite 107  
Dallas, Texas 75251.  
Received 19 May 1983.

### Comments on Chronology

It was good to read Mr. Richard Niessen's article on chronology in the *Quarterly*.<sup>1</sup> While I endorse most of the arguments which he put forward, his discussion of the variations found in the Septuagint being especially interesting, there are a couple of points on which I must differ, and which, I believe, are important enough to be put forward.

(A) Niessen takes Israel's stay in Egypt to have been 430 years, as, of course, the rendition of Exodus 12:40 in e.g. the American Standard Version would suggest. But I believe that the 430 years do not refer only to Israel's time in Egypt, but to the whole time from Abram's entry into Canaan until the Exodus. The period of Israel's stay in Egypt was only half as long: 215 years. The following lines of evidence support this conclusion:

(1) St. Paul's statement in Galatians 3:17 makes sense only with this interpretation.

(2) Josephus (St. Paul's near contemporary, incidentally) specifically states this to be the case, in the *Antiquities* XV:2.

(3) The rendition of Exodus 12:40 in the Septuagint confirms the same.

(4) The Massoretic Text of this passage (as opposed to the more recent translations of it) definitely allows this meaning, and might be rendered: "Now the living time of the Children of Israel (who dwelt in Egypt) was 430 years . . ." The point is that when God first gave the promise to Abram, the children of Israel were then and there reckoned as being in existence. This is the principle and promise of Romans 4:17: "... God, who quickeneth the dead, and calleth those things which be not as though they were . . ." (K.J.V.)

Genesis 15:13 is not in contradiction to this, for the 400 years refers not to the "affliction" only, but to the total period of "thy seed" until the end of the affliction; and it is given as a round figure. This fact sits better in the Hebrew than in the English translation.

(5) The genealogy of the Tribe of Levi, in Exodus 6, shows that a period of 430 years in Egypt would have been impossible, as follows:

Levi, who lived 137 years total, begot Kohath, who lived 133 years total and begot Amram, who lived 137 years total and begot Moses, who lived 80 years until the Exodus. Moreover, Amram married Jokbed, Levi's daughter, as mentioned in Numbers 26:59.

Details in Genesis 46, and narratives such as that concerning Judah's marriageable sons in Canaan, in Genesis 38, make it clear that Kohath was born before Levi went to Egypt. Therefore, the maximum possible time which could have elapsed in Egypt would be Kohath's age plus Amram's age plus Moses' age at the Exodus. This would give 133 plus 137 plus 80, a total of 350 years.

But even this is too great, because it assumes:

(a) That Kohath was just born at the time of the entry into Egypt.

(b) That each of the persons listed was born in the year of his father's death.

Both of these things are unlikely; thus a stay in Egypt of 215 years is more likely than 430.

I can agree with Mr. Niessen on the date 1446 B.C. for the Exodus; so Abram came to Canaan 430 years earlier, in 1876 B.C.

(B) The second point on which I must differ concerns Mr. Niessen's statement about Abraham: "First he can be placed at about 2000 B.C. archaeologically." Dates ultimately depend on eyewitness accounts, if they are to be reliable (and even they are only as reliable as the witnesses). Dates obtained otherwise, e.g. from archaeology, depend on even more assumptions. Of course, when the witness is God, as recorded in the Bible, we take His testimony to be reliable. The Biblical date, then, for Abraham's life is about 1950 B.C. to 1775 B.C.

Many archaeologists place this time during the so-called Middle Bronze I period. But they arrive at this by means of an evolutionary chronology, aided and abetted by the popularly accepted but unconfirmed Egyptian chronology which raises more questions than it answers.

The fact is, there is no evidence to show that Abraham lived during this MBI period. Rather, positive evidence can be produced (but space will not permit it here) to show that Abraham's time was the so-called chalcolithic of Palestine. This fact calls for a drastic re-dating of the archaeological record against the simple record of Scripture, and not vice versa.

#### Reference

1. Niessen, Richard, 1982. A Biblical approach to dating the Earth: a case for the use of Genesis 5 and 11 as an exact chronology. *Creation Research Society Quarterly* 19(1): 60-66.

Yours in Christ,  
Dr. A. J. Osgood  
Creation Science Foundation  
Box 302, Sunnybank  
Queensland, Australia.  
Received 5 May 1983.

#### Reply to Osgood

I appreciate Dr. Osgood's interest in, and response to, my article. Like him, I reject the traditional archaeological designations for ancient periods based upon

the alleged evolution of technology (stone-bronze-iron). According to Genesis 4:22, men were proficient in the use of bronze and iron 1000 years before the Flood.

I did not mean to imply that we have an extra-Biblical document or tablet giving Abraham's name and date of birth. I meant merely that Abraham lived in a milieu which was about 2000 (rather than 20 or 20,000) years B.C.

As to whether Israel was in Egypt for 215 or 430 years. Since historical and chronological questions regarding the period of the Exodus are not my forte, I have solicited comments from Dr. Eugene Merrill of Dallas Theological Seminary, whose chronology<sup>1</sup> I used as a springboard for my article. His comments, in part, are as follows:

I wish I had the time to answer the objections to a 215-year sojourn adequately here. I have worked it all out (to my own satisfaction at least) but have not yet been able to publish it . . . A major problem to the 215-year view is that it would place Joseph in the Hyksos period, a matter that can scarcely be harmonized with the obviously Egyptian (not Hyksos) background to the Joseph stories. A short sojourn places Joseph in a period ca. 1684-1591 B.C. The Hyksos ruled from ca. 1730-1580 B.C.

Your respondent is begging the question over and over again, especially in the way he handles Ex. 12:40 and Gen. 15:13. Methodologically I am always made uneasy by an approach that has to make its case on the basis of the Septuagint rather than the Massoretic Text *when there is no evidence otherwise of the inferiority of the M.T.*

As for the background of Abraham and his early (ca. 2000 B.C.) date, I have just written an article on this which will appear in an upcoming issue of *Bib. Sac.*

This is really as much as I plan to say on the subject of the Exodus. I don't want to make it appear that I am begging the question here; because that really is not the question, but a rabbit-trail. The main thesis of my article is that there are no gaps in the genealogies, nor can any gaps be forced into them. My point is that the dates for the Flood and the Creation are absolute, they are recent, and they will vary as a fixed unit relative to Abraham (or the Exodus); and I leave it to the O.T. scholars to quibble about the chronological minutia.

#### Reference

1. Merrill, Eugene H., 1980. Fixed dates in patriarchal chronology. *Bibliotheca Sacra* 137(3):241-251.

Yours in Christ,  
Richard Niessen  
Associate Professor of  
Bible and Apologetics  
Christian Heritage College  
2100 Greenfield Drive  
El Cajon, California 92021.  
Received 18 July 1983.

#### Horses in the Permian

Hoof-like markings in the Permian Esplanade sandstone of the Supai Group of the Grand Canyon have

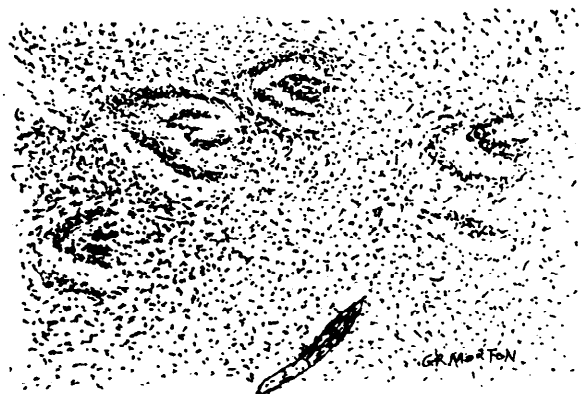


Figure 1. Drawing of hoof-like markings found in the Esplanade sandstone, Grand Canyon. Cf. the photograph in the article cited. The pocket knife gives the scale.

been reported by Edwin D. McKee of the USGS.<sup>1</sup> Morphologically these prints resemble horses' hoofs so closely, that the Supai Indians once believed that they were made by a herd of horses. Even though no present-day authority would verify these prints as those of horses, the views of the Supai Indians should carry some weight since they had no prejudicial bias. Furthermore, these Indians were not unacquainted with the morphology of horse tracks.

Similar hoof-like tracks have been reported three previous times in the literature. C. W. Gilmore reported similar tracks from the Grand Canyon area in 1926.<sup>2</sup> McKee reports,

The similarity to the imprints of horse's hoofs noted in the markings at Fossil Bay, with their semi-oval forms, posterior extremities prolonged backward, and their round or oval ends all pointing in a common direction caused Gilmore (1926, p. 38-39) to search the literature for records of other markings of comparable type.<sup>3</sup>

Gilmore turned up two other reports, one by Hitchcock in 1858 from the Triassic of Connecticut.<sup>4</sup> From personal knowledge of the geology of Connecticut, I should say that these prints would have to be in the Hartford Basin, a major Triassic basin running north-south through the state. The other report of hoof-like prints was by Jardine in 1853 from the New Red Sandstone of Scotland.<sup>5</sup>

The advantage these tracks have for the creationist position over other tracks (including human ones) is that the USGS employee, McKee, verifies that these are genuine tracks (although he does not believe they are the tracks of horses). He notes,

No information is available on the type of animal represented, but the pairing of the impressions, the common directions of orientation, and the uniformity of shape, all suggest an origin as trackways of a quadrupedal animal.<sup>6</sup>

These tracks strongly imply that the horse was in existence long before Eohippus, the supposed earliest ancestor of the horse.

#### References

1. McKee, Edwin D., 1982. Distribution and age of fauna and flora. The Supai Group of Grand Canyon. USGS Professional Paper 1173. U.S. Government Printing Office, Washington. Pp. 75-112.

2. Gilmore, C. W. Fossil footprints from the Grand Canyon. Smithsonian Miscellaneous Collection vol. 77, no. 9, (41 pages).
3. Reference 1, pp. 93 & 94.
4. Hitchcock, Edward, 1858. Ichnology of New England: a report on the sandstone of the Connecticut Valley, especially its footmarks. W. White, Boston. (200 pages.)
5. Jardine, William, 1853. The ichnology of Annadale, or illustrations of footmarks impressed on the New Red Sandstone of Corncockle Muir. Edinburgh. (17 pages, 13 plates.)
6. Reference 1, p. 96.

Glenn R. Morton  
3313 Claymore  
Plano, Texas 75075.  
Received 6 June 1983.

#### Level Does Not Prove Age

I refer to the comments made by Glen Morton on pages 52/53 of *C. R. S. Quarterly* of June 1983 in respect of the alleged Geologic Column. Mr. Morton seems to have misunderstood my criticism of the validity of the "column."

As shown in figure 1 of his article there can be no doubt that certain beds or deposits have been laid down by superposition but the only question is—how long did it take? I do not dispute the validity of superposition per se. But why is it so necessary or desirable to go around the world trying to co-relate fossil beds beyond a certain broad order? Why not, as I stated on page 52 take each fossil deposit on its own merits? i.e., simply accept that in Locations X, Y, Z, we find certain fossils that leave us, not in any doubt as to their existence, but only in doubt as to how long it took for their deposition.

If we accept this way of looking at fossil deposits, then there is no need to start talking about "sooner or later," "earlier," etc., *in the sense of such life-forms being separated by long periods of time*. There is no intrinsic way by which we can tell whether fossil X, found in America in one deposit, appeared "sooner or later" than fossil Y, found in another deposit in Australia. Please just accept that the fossils were laid down *some-time*. This is why I object to the terms such as Silurian, Permian, Paleocene, etc., and to the terms "appeared first in the fossil record" in geologic history. For all we know, and as Creationists maintain, most fossils could well have been deposited over a period of only hundreds or a *very few* thousands of years.

The fact that many beds are tilted has no bearing on the matter. Several beds could be uplifted, tilted or otherwise contorted within a few hundred years from when they were originally laid down.

I also uphold my belief that erosion and redepositions should very seriously confuse the uniformitarian geologic column—if they occurred over millions of years. Not all erosion consists of slow weathering of the strata. Most erosion occurs under sedimentary conditions such as large-scale flooding. If the "column" is indeed 600 million years old, there should be mass evidences of whole beds being ripped apart and their fossil contents scattered willy-nilly in large amounts over other areas of so-called "later" deposits. Yet such cases are almost unknown. Why is this so? It is my belief that *there has not been enough time* for this to happen and thus all sedimentary deposits are young.

It is true that we cannot use such terms as Mortonian or Mehlertian but neither should we be bound by the orthodox terms which can be misleading. We should simply refer to deposits as say "Fossil amphibians at X Creek, Arizona," or "reptilian fossil finds at Mount Isa, Australia," etc., except when we are directly referring to an orthodox article or publication. In our own Creationist writings in our own journals, let us not be led into the uniformitarian trap thus tacitly admitting there was such a period as the "Eocene," or the "Jurassic," etc.

It may be possible to demonstrate that a certain "column" exists here and there in the world, but not how long it took to lay down those fossils; and the time-span is what the whole argument is all about.

Yours faithfully,  
A. W. Mehlert (Dip. Th.)  
21 Greenaway Street  
Lawnton, Queensland,  
Australia.

Received 27 July 1983.

### Fact and Method Need to be Distinguished

The reviewer of *The Neck of the Giraffe* (June 1983) has done an excellent job; but I think it may be worthwhile emphasizing the confused thinking which characterizes Hitching and other writers on evolution. This confusion may be summarized as: "Darwin's theory of evolution" means "Darwin's idea of HOW evolution occurred." Attention is thereby focused on the (admittedly uncertain) *method* by which the (supposedly irrefutable) 'fact' of evolution took place. But the phrase 'Darwin's theory of evolution' to his contemporaries undoubtedly meant 'Darwin's theory THAT evolution has occurred.' The 'of' is subjective, as in 'my breakfast of eggs and bacon'; which of course means 'my breakfast *consisting of* eggs and bacon.' So Darwin's TOE means, 'Darwin's theory, evolution.'

Perhaps an illustration may help. A millionaire,

John Smith, disappears from his London home: foul play is suspected. Police Inspector Lestrade discovers that Smith had an enemy, Jones. One trail leads to Dover, where a pub-keeper claims to have seen Smith. It is confirmed that a Mr. Smith boarded a cross-Channel steamer on the night of the disappearance, but at Calais the trail peters out. Lestrade propounds the theory that Smith was murdered by Jones, thrown overboard in the Channel. His newspaper articles on 'THE SMITH MURDER CASE' convince nearly everyone that Smith was indeed murdered. But then Jones turns up . . . with a perfect alibi. Further investigation reveals that the publican was mistaken, and the Smith who boarded the steamer was K. Smith, not J. Smith. At every point Lestrade's case falls to pieces, but *the public still believes a murder has been committed*. A host of amateur detectives compass sea and land to track down the 'murderer.' A hundred rival theories are bandied to and fro. Lestrade's theory *about* the murder becomes only one of many; but it was Lestrade who started the whole wild goose chase by plausibly insisting *that* a murder had been committed. Finally, ten years later, John Smith turns up with a new wife and family in Australia . . . which makes the man-hunters look rather silly.

In a somewhat similar fashion, I suggest, scientists like S. J. Gould and Maynard Smith dream up hypothesis after hypothesis to account for something that never happened. In a desperate attempt to convince the educational world that Darwin was wrong *only* as to method, they rush around screaming 'MURDER! MURDER!' when all the time the 'victim' is alive and well. John Smith in my parable is, of course, the Bible doctrine of creation. Hitching has done well to demolish Lestrade's (Darwin's) "evidence": let us hope he may soon abandon the "murder" (evolution) fallacy altogether.

David C. C. Watson  
1306 N. Cross  
Wheaton, Illinois 60187.

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### PLACEMENT SERVICE

Do you know of academic vacancies to which Creationists might be directed? The Creation Research Society would like to be in a position to be able to inform Creation scientists of such vacancies. If you know of such positions, will you please inform Dr. John W. Klotz, 5 Seminary Terrace North, St. Louis,

Missouri 63105, describing the position and the academic requirements and training required, and giving any other information which might be available?

Graduate students who are interested in placement may write to Dr. Klotz for information about any available positions which are known to the C.R.S.

## PROPOSED BOARD COMMITTEE STRUCTURE

During the last two years considerable time has been spent in attempting to streamline the operation of the Creation Research Society. Before the last meeting, a simple re-organization plan was circulated to all board members. This plan was discussed and modified extensively at the meeting and final touches were added by correspondence during the past few months. The following proposed Article V of the By-Laws is the result of these discussions and will be voted on at the next annual meeting.

### PROPOSED ARTICLE V OF BY-LAWS COMMITTEE STRUCTURE

1. The policies and directions of the board shall be carried out primarily through officers and committees who shall be responsible to the board.
2. Members of these committees shall act primarily as assistants to the chairman who is to carry out committee responsibilities.
3. All board members shall be a member of at least one of the standing committees.
4. The committee members shall be appointed by the president who shall be a member ex officio of all committees.
5. The chairman of each committee is responsible for an annual written report of the committee. This report shall be submitted to the recording secretary (secretary of the board).

The responsibilities of each committee shall include the following:

1. *Research Committee:* Responsibilities shall relate to the research goals of CRS such as the following:
  - A. Approve and arrange for funding of all CRS research projects. No CRS funds beyond those appropriated by the board shall be used.
  - B. Establish research priorities for desired research.
  - C. Supervise and approve CRS experiment stations operations. The laboratory directors shall be responsible to the committee and the board through the chairman of the Research Committee.
  - D. Recommend experiment station expansion projects.
  - E. Be accountable for all CRS owned property and equipment, insuring that all equipment remains under CRS jurisdiction.
  - F. Develop short-range and long-range research goals and objectives and suggest methods for implementation, and review these annually.
  - G. Be responsible for disposition of all surplus and obsolete equipment.
  - H. Recommend and approve all research fund raising activities.
  - I. The chairman shall be elected by the Board.
2. *Quarterly Editorial Committee:* Responsibilities will relate to the production of the CRSQ such as:
  - A. Establish editorial and review policies for all

quarterly articles to insure scholarly peer review standards.

- B. Evaluate and make recommendations regarding subject trends in the quarterly.
  - C. Monitor the quality of articles in, and general format of, the quarterly.
  - D. Secure copyright of CRSQ and file with CRS secretary.
  - E. Review and make recommendations on quarterly format, style, and composition.
  - F. CRSQ editor shall be the chairman of this committee.
3. *Publications Committee:* Responsibilities will relate to publications other than CRSQ such as:
    - A. Production and distribution of monographs, textbooks, reprints and public relations material.
    - B. Secure copyright of materials and file with CRS secretary.
    - C. Provide for necessary editorial review.
    - D. Recommend budget to board for approval.
    - E. Chairman shall be elected by the committee.
  4. *Constitution Committee:* Responsibilities shall relate to constitutional affairs of CRS such as:
    - A. Insure the constitution and by-laws are followed.
    - B. Provide parliamentary advice for business meetings.
    - C. Insure that qualified candidates are slated for board member elections.
    - D. Make recommendations for changes in constitution and by-laws.
    - E. The chairman shall be the secretary of CRS.

Respectfully submitted,  
John R. Meyer.

### ADDITIONAL PROPOSED CHANGES TO BY-LAWS

Present wording:

#### Article III — Membership

Section 1. All members of the Society shall subscribe to the statement of belief contained in Article II and may continue to hold membership only so long as they subscribe to the Statement of Belief and pay dues.

Section 2. Membership shall be divided into three classes. Fellows shall have all rights and privileges of voting membership but shall be exempted from the payment of dues. Voting membership is limited to scientists having at least an earned graduate degree in one of the natural or applied sciences. Sustaining members are those who do not meet the criteria for voting membership. Sustaining members shall have all rights and privileges except those of voting and holding office.

Fellows shall be elected by the Board of Directors at any annual meeting by ballot vote. To be designated as a Fellow an individual must receive the favorable vote of two-thirds of the members of the Board of Directors.

Proposed wording:

### Article III — Membership

Section 1. — No change.

Section 2. Membership in the Creation Research Society may be in one of the following categories:

1. Voting: persons with an earned degree in a recognized area of science or engineering at the Master's or Doctor's level.
2. Sustaining: persons who are interested in the work of the Society but who do not choose to be a voting member and/or who do not have a Master's or Doctor's degree in some area of science or engineering.
3. Senior Members: these include voting or sustaining members who have reached the age of 65.
4. Student: persons matriculated in high school or college who wish to participate in the work of the Society.
5. Emeritus: persons who have served as officers or in other official capacities for the Society and who by reason of age, health or other conditions can no longer serve in such capacities.

In addition there shall be the category of:

6. Subscriber: persons, schools, churches or organizations interested in the literature of the Society and its activities, but not interested in or qualified for other membership categories.



## A PHYSICS COMMUNICATIONS NETWORK

It is plain, from discussions which have erupted from time to time about the theory of relativity, that there are readers of the *Quarterly* who have strong views on the matter, both *pro* and *contra*. These people might be interested in a Physics Communication Network, which is being established and of which we have heard recently. The idea is to provide listings and references to facilitate communication among those interested, particularly persons who disagree with the usual interpretation, and who find it almost impossible to have their ideas published.

More information can be obtained from the organizer, Mr. Geoffrey Page, 26 Oaklands Way, Titchfield Common, Fareham, Hants, England.

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*In Volume 20, Number 1 contained pages 1 to 72 inclusive; Number 2, pages 73 to 128; Number 3, pages 129 to 196; and Number 4, pages 197 to 244*

*All pages of the Quarterly have been numbered consecutively; hence only the beginning page number is provided for each reference.*

*Letters to the Editor are designated by the symbol (L).*

*Items in Panorama of Science are listed alphabetically, according to the contributor, in a separate section.*

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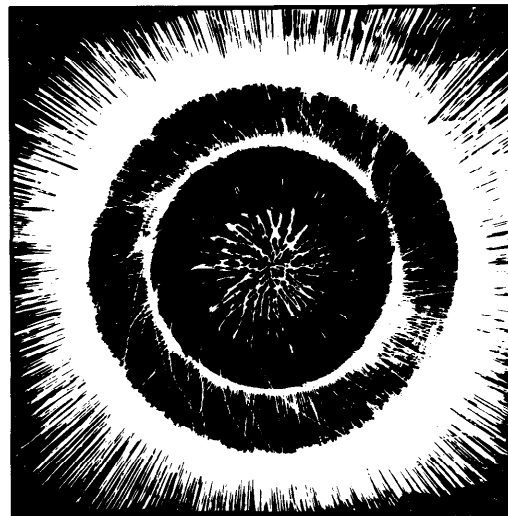


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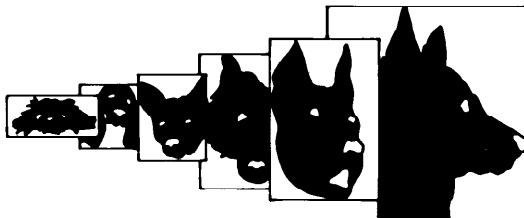
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